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Night View in the Stock Room of a Lamp-Bulb Works. Mazda Lamps with Reflectors Provide Good General Illumination Which Minimizes Breakage in Handling the Stock.

Better Lighting of Glass Works and Potteries

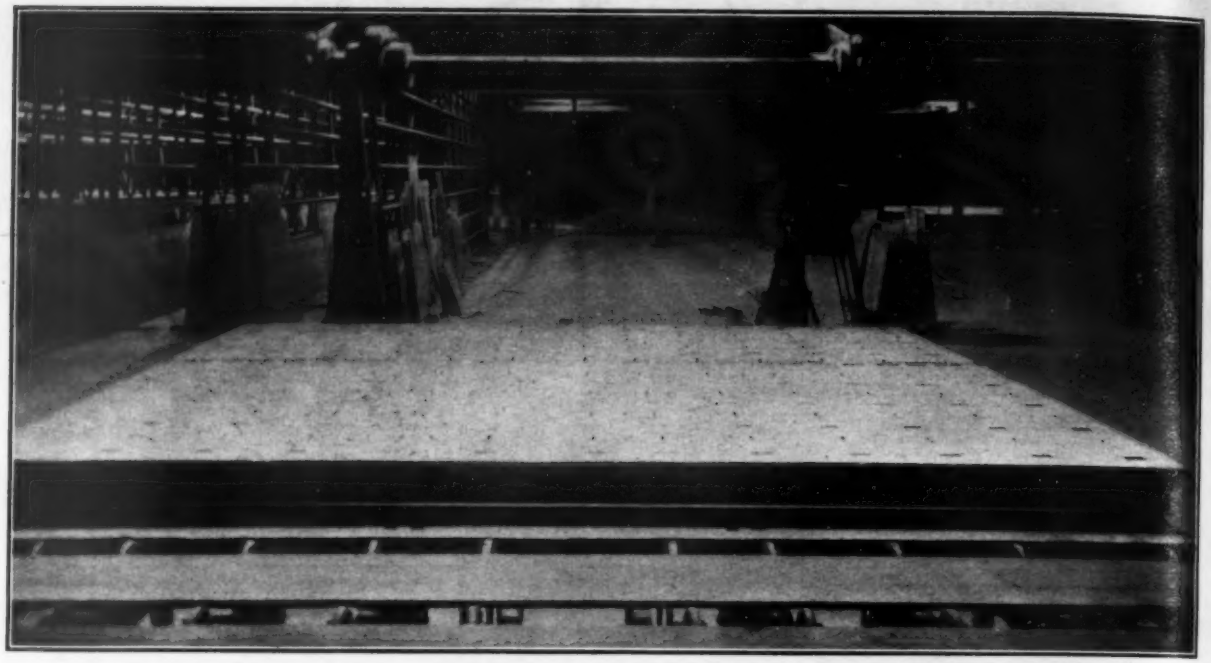
Lighting Conditions Usually Very Poor—Disadvantages Resulting Therefrom—Benefits of Good Lighting—Modern Lighting Meets All Requirements Satisfactorily—Suggestions for Improving the Lighting

By F. H. BERNHARD

This is the eighth of a series of twelve articles on improvement in lighting in as many different industries. These articles emphasize the desirability of improving industrial lighting to meet present abnormal conditions and those to come after the war. The advantages of better lighting are presented in a non-technical way so that they may readily be brought to the attention of factory owners, managersand superintendents, most of whom still have only an imperfect realization of the relation of good lighting to their industries.

Pottery and glass making originated in prehistoric times. During the intervening thousands of years progress was made by spurts here and there, which in spite of many setbacks brought about slow development up to the beginning of the last century when more accelerated progress set in. Although most of the time crude and primitive methods were used, these arts were developed to a high state at different times in certain countries, as is shown, for example, by the splendid specimens of artistic pottery made in ancient Greece that we can find in some of our museums. With the exception of such special periods of development, much of the pottery in common use was home-made and, like the home-spun textiles, was very coarse and inferior in quality.

Wherever pottery and glass blowing were more highly developed, the arts were handed down from father to son. Even after the evolution of these crafts into the industrial stage, the technical secrets and manipulative skill were passed on from generation to generation of craftsmen, who naturally showed a conservative attitude toward innovations that at first



Cutting Table and Storage Racks Near Annealing Lehr in a Plate-Glass Works. Very Satisfactory Illumination Obtained from Mercury-Vapor Lamps.

thought had no direct influence on the quality or production rate of the manufactured product. A result of this tendency is the rather common neglect of improving certain working conditions in glass works and potteries, this being notably true of lighting.

Operating and Lighting Conditions in These Industries.

Before describing the lighting conditions generally prevailing in these industries, it may be well to compare the industries themselves to show to what extent they have points in common and some of the features in which they differ. As regards their products, these are either for plain utility, for utility combined with ornamentation, or for ornamentation almost exclusively, and in this order generally goes the skill and care required in turning out these respective classes of products. All glass and pottery products also have in common more or less fragility, which means considerable breakage before they leave the factory if poorly made or carelessly handled. Furthermore, although machinery and labor-saving methods are now quite extensively used, there is still much manual work in shaping the pieces and in decorating them.

As regards the manufacturing processes, the raw materials must be carefully selected and mixed in proper proportions to insure high quality and uniformity of product, but after that there is a marked difference in the processes. In pottery the mixed and prepared clays are first shaped or molded before being burned or fired, whereas in glass work the sand and mineral salts are first fused before being shaped. A second heating in pottery is for fixing decorative colors, while in glass it is usually for annealing or reducing the fragility. In either case the kilns or furnaces can be built for continuous 24-hour operation so as to secure the best possible fuel efficiency as well as the general efficiency of the plant.

The importance of low fuel cost is shown by the fact that the finding of plentiful and cheap natural gas brought about the location of glass works in several natural-gas districts in this country, but when the gas gave out it became uneconomical to operate them for glass making, so they were converted into potteries, in which considerably less fuel is required; the close connection between the two industries is also shown by this and is further evident from the fact that several companies operate both glass and pottery works, since both glassware and chinaware for household, hotel and restaurant use are purchased by the same customers.

Another point in common between the two industries is that their plants are usually located in the outlying parts of cities or towns and the buildings consist almost entirely of one-story structures. This has an important bearing on the lighting conditions, which evidently are favorable for getting the best possible daylight. This is further promoted in some of the more modern works by liberal window surface which is by no means kept as clean, however, as efficiency requires, especially in potteries. In glass works ordinary skylights are often avoided because direct sunlight on the glass being worked or handled causes annoying reflections; sawtooth roofs giving north-sky daylight are found to be decidedly preferable. In the older plants the daylight conditions are far from satisfactory because of inadequate and unclean window surface and poorly laid out interior arrangements which obstruct what little daylight that enters.

Most plants are operated by day only, night operation being usually confined to tending of the kilns and furnaces. Glass blowing by night as well as by day is increasing, however. Because the practice has been almost entirely to work by day, one finds very meager facilities for artificial lighting in the average plant, whether it be a pottery or glass works. As the manager of a large chinaware house admitted, "Potters don't know the value of light. You will nearly break your neck in trying to go through a pottery." This severe indictment applies equally to the average glass works on a cloudy day or late in the afternoon during the fall and winter, and at all times during the night. What lighting equipment one finds consists almost entirely of glaring, inefficient and

otherwise obsolete lamps, almost invariably bare and frequently hung low. Consequently very poor illumination is the result and this accounts in no small degree for the opposition to night work or even overtime that is encountered among the workmen.

Some Disadvantages Resulting from Poor Lighting.

It may be well at this point to call attention to a few of the disadvantages under which a plant operates that has poor lighting. These apply in general, regardless of the nature of the lighting, whether it is daylight or artificial light. Briefly, the chief ones may be listed as follows:

(1) Production is retarded.
(2) Quality deteriorates.
(3) Accidents increase.
(4) Breakage of product increases.

Retarding of production whenever there is insufficient or unsatisfactory light has been found to be a serious handicap in every industry whose lighting conditions have been examined by illuminating engineers. Whenever the workmen cannot see their work readily without straining their eyes, they will instinctively do it slower, or, if attempting to maintain accustomed speed, they will do the work more carelessly and make more mistakes. Efficient work cannot go on when it is difficult or impossible to see the work properly. This applies in pottery and glass making as well as in any other industrial work. Only a few reasons need be cited here. One is that we have eyes that we depend on for giving us perhaps the chief knowledge of what is going on about us and we unconsciously use our eyes much more than we believe to aid us in work. In order to use the eyes effectively we must have light to delineate the objects being handled or worked with. If the light becomes insufficient or unsuited for this purpose, more reliance is placed on the other senses, touch and sound especially, and this change causes an increase in nervous strain in many cases. More important, however, is the increase in muscular and nervous strain on the eyes when an effort is made to continue to see in poor light. Even where pain does not consciously result from this, slowing up of work occurs, due to small time losses in nearly every operation.

In the case of glass blowers it is sometimes contended that light interferes with their discernment of the temperature of the glass on the blow pipe by the degree of its red glow. This is true of unsuitable light, however, such as strong direct sunlight or glaring and extessive artificial light; it is not true of diffused daylight nor of proper artificial light. When the glass blower works in a blow room that receives no other light than that from the furnaces and hot glass, he works under unfavorable conditions that can result only in much eye strain and impaired efficiency. The contrast between the bright light from the furnace openings and the low brightness of the remainder of the room is so great as to give the sensation of glare with eye strain and fatigue. It is known that marked and continual brightness contrasts in the field of vision quickly fatigue the muscles that try to close and open the iris for bright and dim light. It is not noticed by day because the generally diffused daylight diminishes the extreme brightness contrasts; for instance, an automobile headlight may be lit by day and never noticed, whereas at night it doubtless will cause much annoying glare.

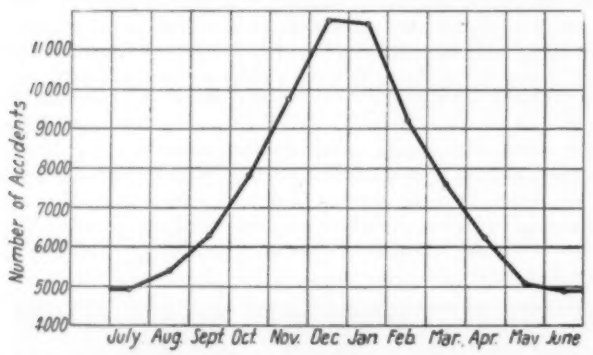
It has already been stated that attempts to keep up normal speed of work when the light becomes poor can mean only increased eye strain or inferior work; the only exception to this is where the work is done almost automatically by the sense of touch and without requiring any visual effort. There is little or no work of this character about a pottery or glass works in which all operations are aided very materially by the sense of sight. Where vision is handicapped by poor light either the speed or quality of the work suffers and usually both. This accounts for considerable outright spoilage of work during process of manufacture and much of the poorer quality of product that must be put among "seconds" if some of the waste is to be retrieved. Unbiased analysis shows that poor lighting conditions produce a heavy loss from spoiled and inferior goods. If these are detected

Furnace and Blow Room in a Lamp-Bulb Works. The Entire Room Is Filled with a General Flood of Light. A Conduit Encircles the Furnace Entirely and from It Are Hung at Intervals Mazda Lamps in Inclosing Globes. These Provide Enough General Light to Reduce the Brightness Contrasts to an Unobjectionable Degree. The Light Streaks in the Working Areas Are Due to the Workmen Blowing and Manipulating the Hot Glass While a Long Photographic Exposure Was Made. Although Six Lamps Are Shown Lighted, the Absence of Glare from Them Is Manifest by the Way They Blend Into the General Brightness of the Room.

before shipping, a firm's reputation may not suffer, but if the final inspection is also handicapped by poor lighting so that cracks or other flaws in glassware or crockery, for instance, are frequently allowed to go by the reputation and business will be seriously impaired.

Wet clay on roads is a common cause of skidding and slipping. In potteries it is no less a cause of slippery floors and many falls, especially when the lighting is inadequate. The statement of an informed and responsible official has already been quoted on the matter. Treacherous places and passages in the clay-preparing rooms are the ones most neglected as to lighting and therefore the scene of many accidents caused by inability to see dangerous spots. In glass works the vicinity of the furnace is where many burns occur if the lighting is poor. Countless cuts and bruises are incurred when there is not enough light to see the sharp edges of broken glass.

Poor lighting is the cause of nearly 24 per cent of all industrial accidents, according to the most reliable analysis of factory-accident reports ever made. This covered about 91,000 accidents during a typical normal year before the war on which reports were received and studied by a large accident liability insurance company. Unfortunately, there is no record of any analysis of accidents in glass works and potteries, but there is no reason to believe that the proportion of accidents due to meager or unsuitable lighting is less than the general average given above; in all likelihood it is greater. The loss of time, the surgical expense



Curve Showing How Industrial Accidents Increase During the Winter Months with Their Short Days and Usually Inadequate Artificial Lighting. Records Analyzed by Large Liability Insurance Company.

and actual damages paid to employes amount to a considerable item in the course of a year which improved lighting will diminish.

But another loss, partly as an outgrowth of accidents, is the large amount of breakage of glassware and clay products that is produced where poor lighting prevails. Serious as this is in pieces that have not yet been finished, it is more costly in finished pieces on which all the manufacturing cost is a dead loss. Poorly illuminated storage, packing and shipping rooms account for much absolutely needless waste.

Direct Benefits from Improved Lighting.

Good lighting has many advantages, several of which are the direct opposite of the disadvantages just discussed. For convenience, the principal benefits are listed as follows:

(1) Production is increased.
(2) Quality is improved.
(3) Overtime or nightwork can be carried on efficiently.
(4) Accidents are reduced.
(5) Spoilage and breakage are diminished.
(6) New employes are broken in more readily.
(7) Working conditions are made more cheerful.
(8) Contentment is promoted among the workers and labor turnover reduced.

That speeding up of production follows from improvement in lighting has been shown most conclusively in the so-called war industries, all of which have found that the production of the urgently demanded war supplies they manufactured has been materially accelerated by good lighting. Some of the reasons for this have already been pointed out. Aside from improved visual conditions aiding in eliminating countless small time losses in the different operations and those due to groping around gloomy premises, there is a saving in time from having the more orderly arrangement which usually accompanies good lighting due to the better supervision it permits. The latter also eliminates the outright losses caused by loafing in dark parts of the plant.

The extent of the production increase in different plants that results from good lighting is dependent on a number of factors, such as the kind of plant, the nature of the process, character of the workmen, etc. It has been found to run from as low as 2 per cent to as high as 25 per cent and over. A conservative average figure for the kind of plants in question would be between 5 and 10 per cent, which is a clear gain in production output without increase in labor cost, a handsome profit from a moderate expenditure for modern lighting equipment.

How quality is affected by lighting has also been discussed in the foregoing. It will suffice here to emphasize that quality is as important as price in glass and ceramic products, in fact, more important in many cases, such as the higher grades of illuminating glassware and electrical porcelain. High quality requires careful watching of every step in the manufacturing process and obviously good lighting is necessary for this purpose.

The statement that pottery and glassware cannot be made properly under artificial light is based on the poor lighting equipment commonly used heretofore. This same fact accounts for the falling off in production on cloudy days and early in the morning and late in the afternoon during the later autumn and all the winter months. Daylight saving has helped since last spring, but on Oct. 27 the clocks are to be turned back to normal standard time (unless Congress acts promptly on the proposal to make daylight saving effective throughout the year). Setting back the clocks will entail sudden loss of an hour of daylight in the afternoon; if the clocks are not set back, an hour of daylight will be lost in the morning compared to our former practice. In any case the shortened days, together with the cloudy and stormy weather of winter, call for the provision of the best possible artificial lighting to make up the deficiencies of daylight.

Such lighting makes the manufacturer independent of weather and season with their variation of daylight. Moreover, it is in the nature of preparedness for probable heavy demands for glass and clay products on the return of normal business conditions. Resumption of building will require large supplies of plain and plate window glass, illuminating glassware and sanitary pottery for plumbing fixtures. Depleted stocks of household crockery and glassware will also have to be replenished. Manufacturers in many lines are contemplating operation with overtime or nightwork so as to meet these heavy demands without the

Tables in the Stripping Yard of a Plate-Glass Works. Excellent General Illumination Secured from Mercury-Vapor Lamps.

large investment for additional buildings and equipment that would be required if work were confined to the usual day shift.

Maximum efficiency is also obtained in several departments by continuous operation. For instance, several manufacturers are ready at the close of the war to build long tunnel kilns through which the pottery slowly passes in a steady, continuous train while it is being burned; marked economy results from this improved process, which gives highest efficiency where the work is carried on by two or three shifts in an almost unbroken 24-hour day. It is certain that every possible means for improving production efficiency and eliminating losses will be studied by the progressive manufacturers to meet the new conditions, even if old processes and equipment will have to be abandoned.

It is not necessary to dwell at length on the other advantages of good lighting. The reduction of accidents has been referred to and results both from improvement in ability to see and reduction in eye strain and impaired eyesight brought about by better lighting. Likewise, modern lighting reduces to a minimum the considerable losses from spoilage and breakage, much of which is not due to carelessness but can be traced directly to poor lighting.

A good lighting system also helps solve the now troublesome labor problem which calls for breaking in new employes frequently and at considerable expense. During the progress of the war the employment of women and boys has had to be increased. A new employe unaccustomed to the layout of the plant and the details of his work always makes numerous mistakes and spoils much valuable material unless he is working under the most favorable conditions. One of these is an abundance of light to see without effort. The labor situation that will develop on the return of peace is a very uncertain one and it is possible that there will be considerable shifting of workers. The provision of good lighting will, therefore, aid quite a bit in reducing the training period of such new employes as have to be engaged.

The gloomy appearance of workrooms in many potteries and glass works has a depressing effect on the workmen. It is certainly not conducive either to alertness nor to contentment and in many cases is responsible for insanitary conditions about the premises. By contrast, a well lighted room, which does not necessarily mean large expenditure for lighting, has bright walls and ceilings and is permeated with a soft flood of light that makes a very cheerful workroom. The absence of eye strain and the evident interest of the plant owner in the working conditions of his employes all aid in making the latter much more contented. In view of the difficulties of the present labor situation and the uncertainties in this matter in the future, this subject is worthy of being given most careful attention.

Modern Development in Lighting Equipment Meets All Requirements in These Industries.

It has already been stated that the owners and managers of glass works and potteries, because these industries have been developed almost entirely with daywork alone, are still prone to believe that satisfactory work cannot be done under artificial light. This belief originates from the poor equipment that most such managers have been familiar with in years gone by, and it is not surprising that, in view of the rapidity of the recent developments in lighting, they may not have been able to keep in touch with them.

It may be said briefly that these latter developments in the lighting art, both in lamps and in lighting accessories, have been very important. In the former, we now have the tungsten-filament incandescent lamp and the mercury-vapor arc lamp that are extremely efficient light sources. In comparison with the carbon-filament lamps which were and still are in such extensive use in these plants, these modern lamps are three or more times as efficient, this depending on the size of the units being compared. Within the last five years further development in tungsten lamps has resulted in the perfection of units employing inert gases for filling the bulbs in place of vacuum, which has meant a further increase in efficiency of about double in the case of large units. These lamps also provide a more white light. The filament is much more concentrated, thus giving more efficient results with reflectors: It is also more brilliant, which involves the need of means to prevent glare, and for which purpose there can be used inclosing globes, frosted bulbs, opal glass caps, cups or bands, or special units consisting of a silver reflecting cap on the lower part of the bulb that reflects the light to the large reflector over the lamp, thus cutting off all direct light rays. Both of the light sources mentioned are employed in glass

works of the more progressive companies with very satisfactory results, giving an illumination that is very efficient and well suited for all purposes, can be made free from annoying glare, and which is obtained at a very low cost.

In the way of efficient reflectors there are available both glass and steel reflectors, the former made in

Mercury-Vapor Lamps Used in Inspection Room of Plate-Glass Works. Inspectors Look Through Suspended Sheets Toward Lamps, Remainder of Room Being Dark. Imperfections Are Easily Detected.

opal, prismatic and mirrored glass, and the latter with either aluminized or, preferably, porcelain-enameled reflecting surfaces. The shapes best adapted for these plants are the deep bowl and the dome, these screening the lamp filament except when looking at it from almost directly below, for which the special means mentioned are used.

A Few Suggestions on Improving the Lighting.

It is not practicable to lay down definite recommendations for lighting betterment that will be applicable in all cases, since the nature of the plant and other local conditions affect the kind of equipment to be used. The suggestions given are more or less suited to general conditions. It must be said that where the plant is large and involves highly specialized processes, such as manufacture of plate glass and intricately cut glass, the services of a competent illuminating engineer are highly desirable. In other cases the advice of experienced lighting specialists is advisable wherever possible in order to obtain both efficient and satisfactory lighting.

There is practically no place in either a pottery or glass works where localized lighting with low-hung lamps individual to each workman is necessary or desirable. What is needed is a moderate intensity of general illumination, reasonably uniform, and free from dense shadows or serious glare. High-mounted lamps with suitable reflectors and diffusing means provide such illumination at lowest initial, operating and maintenance cost. Larger, therefore more efficient, and also fewer lamps are required. By contrast, the small and less efficient lamps used for localized lighting are more numerous, require more wiring, give usually less uniform and more glaring illumination, and are nearly always more troublesome and poorly maintained because too accessible to the whims of the individual workers.

For this purpose bare carbon lamps have generally been used. Fuel conservation as a war measure has prohibited further manufacture of these inefficient lamps. To replace them by tungsten lamps without providing proper reflectors or raising the mounting height would cause a very serious increase in glare. The replacement should by all means be accompanied by increase of mounting height and addition of suitable reflectors to direct the light downward and to spread it as uniformly over the working surface as possible.

In the furnace and blow rooms of glass works the object of the illumination should be to prevent deep shadows and large brightness contrasts which can be done only by general illumination from high-hung lamps as, for example, is shown in an accompanying illustration in which the units are suspended from a conduit encircling the entire furnace. Opal globes completely inclosing the lamps are used to prevent glare.

In bottle or other pressed-glass plants the illumination should be somewhat higher over the molds than where glass blowing alone is done. Especially important is it to get ample and glare-free illumination where inspections are made. Careful inspection, which is facilitated by such lighting, means saving much time and effort that would be wasted on finishing faulty pieces. Another point that should not be overlooked is adequate lighting of passages to and from the annealing lehrs, in the finishing room, stock room, packing and shipping rooms; neglect of this promotes breakage in handling and in moving the glassware from one department to another.

Plate-glass plants require more particular illumination, both on account of the greater care required in handling the large sheets and because inspection must be more exacting and without the annoyance of serious glare from the light sources. Preliminary and intermediate inspections before and after the cutting, grinding and polishing save much time and power otherwise required to grind faulty or refinish imperfectly ground or polished sheets. The final inspection must be most thorough so that all flaws are eliminated from the product selected for the most exacting trade, such as for mirrors. One of the illustrations shows the final inspection and selection in a plate-glass works in which it has been found that mercury-vapor lamps because of their monochromatic light promote high acuity in vision and easy discernment of fine details; this aids in the detection of the slightest blemishes and permits very accurate grading of the glass. If other lamps are chosen, it may be advisable to use an indirect lighting scheme employing angle reflectors over the lamps to throw the light onto large, mat, white vertical surfaces hung parallel with the glass sheets, the inspectors looking through the glass toward the white surfaces which would be glare-free. When not in use these surfaces could be kept from being soiled by placing them face to face.

In potteries the lighting problem is simpler. Where the clay is being prepared only moderate general illumination is necessary. In the molding room fairly high intensity is desirable, especially where small, intricate pieces are being made. After the material has been glazed it is important to keep down any glare by any of the means already mentioned. This can be easily done without decreasing the efficiency of the lighting appreciably. Stock rooms, packing and shipping rooms should not be neglected if excessive breakage is to be avoided.

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New Wood-Burning Station of Northwestern Electric Company

Portland, Ore., Central-Station Plant Nearing Completion Embodies Many Interesting Features — Details of Construction and Equipment

The new steam-electric station and steam-heating plant of the Northwestern Electric Co., Portland, Ore., probably will be completed by November. The result will be a substantial increase of electric power and an extension of the heating area now served. In designing the steam plant especial attention was given to fuel economy and the use of sawmill refuse as fuel under the boilers.

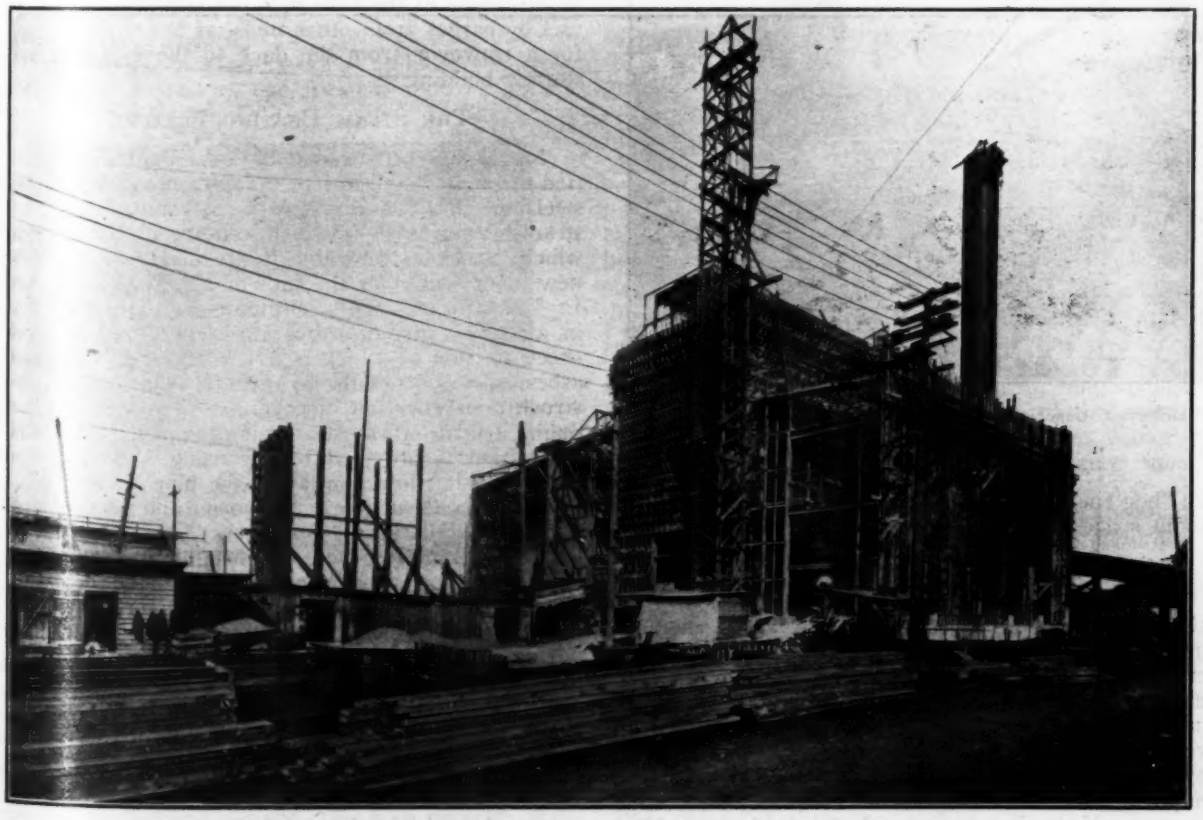
Features of Building Construction.

The plant site is situated on the left bank of the Willamette river, at the foot of Lincoln street, adjoining the mill of Portland Lumber Co., the "hog fuel" from which is to be utilized at the new power house. The building comprises a substructure of wood piling and reinforced concrete, and a superstructure consisting of structural steel frame and reinforced concrete walls, partitions and floors. The foundation consists of a reinforced concrete slab base, 4 ft. thick, resting upon piles, of which 1500 were required, ranging in length from 50 to 70 ft. The top ends of the piles are at a level 30 ft. below the main floor of the building, the latter being at elevation 34. The concrete structure between the base slab and the main floor is made up of piers and struts, two sets high, as shown in one of the accompanying illustrations. This character of construction was essential, not only to support the superstructure load but to resist the lateral pressure of water from the exterior.

Intake Basin and Tunnel.

Adjoining the main substructure on the northeast is the concrete-lined pit, or basin, for condenser circulating water. This basin is 45 ft. long, 15 ft. wide, and extends to a depth of 45 ft. below the level of the turbine floor. In excavating for the basin, very soft material was encountered, and the space for the basin was enclosed by sheet piling driven to the required depth. As the work progressed, water was pumped into the pit, the surface of the water being kept at a higher level than the surrounding seepage water. The excavating was carried on by means of a hydraulic ejector. The side and end walls were concreted by using forms in the ordinary way, but the pit bottom was sealed by pouring a concrete slab, 5 ft. thick, through 30 ft. of water.

The pit, or basin, is connected to deep water in the river by a concrete-lined tunnel, 4 by 5½ ft. and 125 ft. in length. The discharge line consists of a riveted-steel pipe of about the same length. Sets of screens are placed longitudinally through the center of the basin to hold back trash and ice in the intake section,



Construction View of New Steam-Electric Plant of Northwest Electric Co., Portland, Ore.

keeping it from entering the suction of the condenser circulating pumps.

Pumps and Condenser.

Two pumps for supplying condenser water have been installed, with provision for two others at a later date. The first unit consists of one 20-in. and one 24-in. centrifugal pumps with rated capacities of 10,000 g. p. m. and 20,000 g. p. m., respectively, each direct-connected to an induction motor. These pumps are of the Byron Jackson type. The one condenser at present installed is the Wheeler surface type, equipped with Voltz and primary heaters, and having a cooling surface of 18,000 sq. ft. The condenser is placed immediately below the turbo-generator set, the exhaust from the steam turbine passing straight downward thereto.

Steam Plant Equipment.

The initial installation of steam equipment consists of three batteries of Sterling water-tube boilers, two to each battery, with a combined rated capacity of 6000 hp., but which will stand a heavy overload. All boilers are equipped for double firing, having oil burners at the back end and extension furnaces for burning mill refuse, which is fed by gravity through chutes at the top. Plans contemplate a dependence upon this class of fuel as long as it is available, and especially during these times of shortage and high prices of fuel oil. Two batteries of boilers are set on one side of a center aisle in the large boiler room and one battery on the opposite side. Overhead in the center aisle are V-shaped bins from which the chopped-up "hog fuel" is discharged into the fireboxes. Boiler-room space is provided for additional batteries.

Reinforced Concrete Substructure of New Northwestern Station.

Turbogenerator Unit.

The first installation on the generator floor consists of a General Electric 7500-kw. turbogenerator unit rated at 6900 volts, 3-phase, 60-cycles, to be operated at 1800 r. p. m. Plans provide for another unit of 20,000 kw. later on. Accessory to the initial unit is one 4000-kw. transformer for stepping up the voltage from 6900 to 11,000. Excitation will be done by one 100-kw. turbo-generator exciter and a 75-kw. motor-generator exciter set. There are, also, four steam turbines for operating boiler-feed pumps and other auxiliaries; two are 120 hp. each, the other two being 100 hp. and 20 hp., respectively.

The switchboard equipment comprises the generator and exciter panels, and those for double-circuit alternating-current tie lines, double-circuit feeder lines, and the control panel for the storage battery and motor-generator set. Blank future tie-line and station-service panels are also installed. The transformer equipment consists of three 200-kw. transformers.

Preparing and Conveying Mill Refuse.

The mill refuse of the Portland Lumber Co. is carried by conveyors and fed into a motor-driven machine by which it is cut and ground into a product of moderately uniform size suitable for feeding into the boilers. This is called "hog fuel." It is discharged from this machine to a conveyor by which it is distributed into hopper-bottomed bins. The sizes to which the pieces are reduced are such as to prevent clogging in hoppers and chutes. The Northwestern Electric Co., in order to utilize this product of the adjoining lumber mill, is installing a belt conveyor from the mill to the top of its new powerhouse. This conveyor has a length of 150 ft. and runs at an inclination of 30° from the horizontal, and at the upper terminal will discharge the fuel upon a cross conveyor running the full length of the top of the building, which discharges into the fuel bins above the boilers. The excess amount of fuel is to be carried by another conveyor to large storage bins in a separate building. Provision is made for redistributing this stored material to the boiler-feed bins by conveyors. By a system of six belt conveyors and five chain conveyors, operated by 5-hp. and 10-hp. motors, this mill refuse in suitable form for burning may then be handled in any desired quantity. The company will not be limited to the refuse of the local mill, but may receive similar fuel by barges from other mills, as the plans provide for a conveyor from the dock to the fuel bins and storage building.

The Steam Heating Feature.

Steam heat produced at the new plant will be carried through 6000 ft. of 12-in. extra heavy lap-welded steel pipe to a connection with the company's present steam-heating system which centers in the Pittock, which is more centrally located. Heat from the new plant will enter the pipe at 225-lb. pressure and 125° superheat. The steel pipe is insulated with a 1-in. air space, surrounded by a 2-in. pyro-bestos air-cell sheet, outside of which is a 1-in. sheet of laminated asbestos, wound with tar paper. This entire pipe structure is enclosed in concrete. This effects thorough insulation, and affords complete protection. Expansion is provided for by using Ross cast-steel slip-expansion joints in laying the pipe line.

In the construction of the power and heating plant and the installation of equipment, Chas. C. Moore & Co., San Francisco, were the designing and installing engineers. B. C. Condit, chief engineer for the Northwestern Electric Co., had engineering supervision for that company which erected the building and did the wiring with its own force.

ELECTRICITY IN THE MINING OF TIN.

In the Federated Malay States, during 1917, 55,576 hp. was used in the mining of tin. Of this amount, 2420 hp. was obtained from steam-electric, and the balance from hydroelectric plants.

PRECIPITATION FROM FLUE GASES.

Interesting Installation at Copper Refinery Where Metal Particles Are Recovered by the Cottrell Process.

In refineries of different types there is always a possibility of some valuable by-products being lost by being carried along with gases ascending in the flue. This is particularly true in the metal treating field. Here it has been found possible to save solid and liquid particles from the flue gases by an electrical process, known as the Cottrell process. This consists in passing the gases through tubes in which are suspended wires or chain charged with high-voltage direct current. In passing through the tubes the particles carried by the gases become electrified and are projected against the walls of the tubes. These tubes are grounded and the particles drop into hoppers below.

An interesting application of this process was recently made in a copper refinery. In this particular installation there was a noteworthy feature in the size of the generating and transforming unit used. In plants of this type the electrical equipment is generally split up into a number of small units; in this case, however, all the current is handled by a single generator and transformer.

The tubes containing the high-tension electrodes and through which the flue gases pass are arranged in six groups. The electrodes are suspended at the top from a rack which provides ample insulation (see Fig. 1), and are connected with the high-tension direct-current line at the bottom. Disconnecting switches permit the current to be cut off from any group to permit inspection and repairs.

It is stated that tests show that over 90 per cent of the flue dust can be removed and that the value of the copper, zinc and other metals recovered will within a short time pay for the entire treating equipment. It is calculated that at full load ½ ampere high-tension direct current is needed.

Generating Equipment.—Two 40-kv.a., 60-cycle, single-phase generators operating at 1800 r.p.m. are

Fig. 1.—Interior of Treater Showing How Electrodes Are Suspended in Treater Tubes.

arranged to deliver voltages ranging from 150 to 250 volts. A direct-current power line supplies excitation current. A 50-hp., 230-volt, direct-current motor drives each generator. Fig. 2 shows a general view in the generating room.

The transformers are of 40-kv.a. capacity, 200 volts low tension and 100,000 volts high tension. Additional taps are provided from which voltages of 50, 62½, 75 and 87½ per cent of the maximum voltage can be obtained, the full capacity of the transformer being available on each tap. The high-tension leads pass out from the transformers through condenser-type bushings, which are made up of alternate layers of metal foil and insulating material and provide a

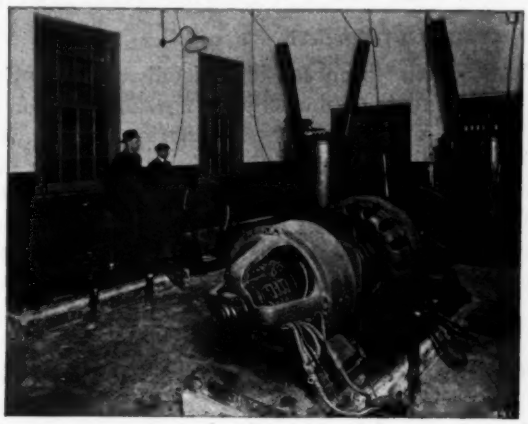


Fig. 2.—Electrical Equipment Showing Motor-Generators Transformers and Rectifiers.

higher degree of insulation than can be obtained from any other form of construction of the same diameter. Choke coils are located inside the transformers to smooth out any static surges.

To the motor-generator shafts are coupled the rectifiers for transforming the high-tension alternating current into direct current.

Control Apparatus.—The switchboard consists of two panels, one for each generating and transforming set. Each panel carries in the following order from top to bottom, a circuit-breaker on the line between the generator and transformer, an alternating-current ammeter and voltmeter, a switch to reverse the polarity of the high-voltage direct current, a motor field and line switches, a generator field rheostat, a five-point switch for making connections with the high-tension transformer taps and the motor-starting rheostat.

The voltage of the high-tension direct current must be varied according to the condition of the flue gases being treated. The transformer taps provide the large steps for this variation and the voltage adjustment of the generator the small steps. In addition, a bank of adjustable resistors is connected in series with the low-voltage alternating current; this acts as a ballast and permits of further adjustment of the voltage. These banks are located on each side of the switchboard. Resistance is also provided in series with the high-tension direct-current line by resistance tubes mounted above the rectifiers.

Auxiliary Synchronous Motors.—Under ordinary operating conditions the motor-generators described above are employed so that there is no direct connection between the high-tension direct current and the power lines of the plant; but in case of emergency, current from the alternating-current lines can be fed into the transformers and used to provide the high-tension operating current. Under such circumstances the rectifiers driven by the generators cannot be used, so in their place are employed auxiliary rectifiers driven by 2-hp. synchronous motors which keep the rectifiers in synchronism with the current being rectified.

Editorial Comment

Standardize the Plugs and Receptacles on Appliances

THERE has been considerable discussion during recent years on the subject of standardization of plugs and receptacles without much progress having been made, due largely perhaps to the fact that every manufacturer is reluctant to change from his own patented designs for which he has built up a good demand. The discussion, however, has centered itself largely, if not entirely, on the subject of wall outlets and the various types of plugs for insertion into them and into ordinary lighting sockets. It is true that there is great need for standardizing these classes of plugs and receptacles, but an equally great, if not greater, need exists for the standardization of the receptacles on appliances and of the plugs designed to fit into them.

It is generally relatively easy to adjust any outlet for use with a given plug or to have it changed if necessary by an electrician. However, it will be found that in most homes there is still greater need for the receptacles on appliances to be so designed that one cord can be used with any of the appliances, this making it unnecessary when discontinuing the use of any appliance and starting the use of another to remove the old cord and substitute another with a plug that will fit the second appliance. As a general rule, people avoid the use of two appliances at one time for several reasons, among which may be mentioned the objection to numerous cords, the lack of sufficient outlets, the lack of capacity in wiring, etc. It is, hence, important if the maximum use is to be obtained out of electrical appliances with a minimum of inconvenience that a user be able to insert an appliance plug into any table appliance regardless of make.

It should be easy for the manufacturers of table appliances to effect this standardization as practically all the receptacles on appliances are of the prong type, the size, shape and spacing of the prongs being the only points of difference and the receptacles are only a minor feature in the design of appliances. There should be no patent rights of such a nature as to hinder or prevent this needed standardization.

It would benefit all appliance manufacturers and the electrical industry as a whole if the former would get together and decide on a standard of construction for the receptacles on appliances as it is little things like the non-interchangeability of appliance cords that hinder the more rapid introduction and the wider use of electric table appliances.

Let no offer of a deceptive truce keep you from buying more Liberty Bonds.

Thrift Habits Developed by War May Aid Utility Financing

LIBERTY LOAN results, with the present campaign only about two-thirds over, are exceeding all our previous efforts, in spite of the evidently camouflaged peace offer of the wileful enemy who hopes to get away with as much of his ill-gotten spoils as possible. The American people will not be so readily misled, but will doubtless show their determination to bring the foe to humble submission to his well-earned fate by oversubscribing the loan and carrying it over the top by a goodly round sum. Although it is always poor policy to count one's chickens before they're hatched, and there must be no relaxation in efforts to make the loan a splendid success, it will not be inopportune to draw certain conclusions from the facts already known.

Americans have been accused for a generation or more of being spendthrifts. This unenviable reputation was somewhat deserved, especially by certain scions of the wealthy, whose lavish expenditures have given the impression abroad that we do not know the meaning of thrift. Taking the country as a whole, it is certain that we have not earned a marked record for frugality. The present war, however, with its ruthless upsetting of so many traditions, is bringing about a most important change in this respect. The record of the successive Liberty Loans is conclusive. The second loan had more subscribers than the first one; for the third loan the number of subscribers had risen to about 17,000,000; for the present loan it is hoped, and expected, that it will reach over 20,000,000, or roughly, nearly one out of every five inhabitants in the country.

The great bulk of these subscribers are people of very modest means. This is shown by the following: Assuming that the fourth loan will be subscribed only to the extent of the assigned total of six billion dollars and that this total will be taken by the estimated minimum of 20,000,000 subscribers, the average amount of each subscription will be $300. Since there are already in hand a large number of subscriptions amounting each to several millions of dollars and a still larger number each running in the hundred thousands, etc., it is evident that the average amount subscribed by the people in moderate circumstances is perhaps not over half of the general average, or, say, below $150. This may seem a modest amount, but when multiplied by many millions of small subscribers it aggregates a very large sum, possibly nearly one-third of the total amount raised.

Most interesting about this, however, is the fact that the great bulk of the investment by the small holders of Liberty bonds represents savings that here-

tofore never entered the investment field, indeed, did not even reach the savings banks. This is shown by the savings deposits in the banks remaining normal or even increasing in the last two years, which is conclusive evidence that deposits were not withdrawn or diverted to any appreciable extent in order to purchase Liberty bonds.

In short, the war has greatly developed among our common people the saving habit and this in spite of greatly increased costs of living. Urgent pleas for the elimination of waste and the cultivation of thrift have had their effect in changing an extravagant and careless people with little thought of the morrow into an economical and frugal people ready to provide from the surplus of flourishing days for the needs of old age and adversity. It has brought into the banks people who never before saw the inside of such institutions and into the financial field millions of investors who never before saw a bond or had the least conception of what it stood for.

What is the probable permanence of the saving habit of this large class that either never had acquired it or only to a slight degree? It is, of course, well known that one cannot permanently change the habits and customs of a large part of the population in a few months, and yet it is only necessary to look to France to see what enduring effect war necessities may have. When the present would-be world conquerors exacted the heavy war indemnity of France after the war of 1871, the saving habit was given a powerful impetus and France developed into the most thrifty nation on the globe. We will, of course, never have a like stimulus, but we will have greatly widened investment opportunities that many who are now investing in Government bonds will be glad to avail themselves of and which will act as an incentive to continuance of the saving habit. Moreover, the imminence of national prohibition, which it is earnestly to be hoped will be made permanent, will save the nation several hundred millions of dollars that are now absolutely squandered. Allowing for the considerable number of present Liberty bondholders who will not continue efforts at saving, there undoubtedly will be an extremely large number who will appreciate the added income received from their bonds and thereby be induced to not only keep on saving but also to invest these savings remuneratively.

Because of this, bankers look forward to greatly enlarged saving deposits after the war and financiers in general anticipate a great influx of new purchasers in the bond and stock markets. These prospective purchasers will also be looked to by the promoters of various wildcat, get-rick-quick schemes, who will be ready to pounce on the credulous prospects like vultures on their prey. Herein lies an obligation by all responsible financial interests to warn the public against these dangers. An educational campaign should be undertaken, urging the public to keep its Liberty bonds, to continue the saving habit, and to invest these savings only in bona fide nonspeculative securities.

Electric light and power, electric railway, telephone and telegraph companies have here an excellent opportunity to aid in such educational work, while at the same time showing the soundness of the public utility business and the high character of their securities from the investment standpoint. Quite a number of utilities have had success in floating their securities in the local market among their own customers. This practice gives these customers a better insight into utility problems and increases the good will of the community toward the utility. By all means and without delay should this matter be taken up.

Electrical Christmas Gifts

WHILE the Christmas season has always been looked upon as one of special importance to the retail trade in almost all lines, it is only of recent years that it has been attracting equal importance in the electrical trade. Of course, the use of electric lamps for decorative purposes has long been a feature of Christmas celebrations, but the suitability of electrical appliances for Christmas gifts has received only gradual recognition from the general public. Nevertheless, it is going forward with increasing momentum along with the popularization of electric service in general and the multiplication of electrical devices for providing comfort and convenience in the home, as well as in the factory and office. As a result central stations and electrical dealers have given more and more attention to the Christmas season in choosing their stock, arranging their displays and in planning their advertising. Each year the Christmas sales represent a larger item in the total volume of business and the dealer who realizes the possibilities in this line and utilizes them to the greatest advantage will add greatly to his success.

The reasons for urging the giving of electrical appliances as Chritsmas gifts this year are many times more pertinent than ever before. The spirit of thrift and economy which has been cultivated during the war period will undoubtedly be reflected in the selection of gifts this year, and on this basis electrical appliances appear in a most favorable light. In addition to this there is every patriotic reason for using devices which conserve fuel, food, labor and transportation, and the wide-awake electrical merchant can easily prove how these savings can be accomplished electrically.

In carrying out the electrical gift idea, it is important that the central station or local merchant have a suitable stock ready early and that he should take proper measures to bring it to the attention of the public. The Government has urged that Christmas shopping be done early and electrical dealers should co-operate with other merchants in this direction.

Put Your Dollars Into Khaki! Buy Liberty Bonds.

Week's Events

Compensating Plan for Bell System—Mechanical Engineers To Meet — Results of Open Price Competition System

GOVERNMENT ADOPTS PLAN FOR COMPENSATING TELEPHONE COMPANIES.

All Extensions Will Be Appraised and Their Value Paid in Annual Installments.

The plan of compensation for the American Telephone & Telegraph Co., as agreed upon between Postmaster-General Burleson and the company, differs radically from the terms of the railroad compensation contract with reference to payment for extensions.

Extensions of the telephone system by the postmaster-general to meet abnormal conditions and made without the approval of the system shall be appraised by the interstate commerce commission at the end of the period of control and their value to the system as appraised shall be paid for in installments of 5 per cent per annum.

The principles adopted as a basis of the telephone company's compensation in part, are as follows:

Any compensation fixed for the period of control was to be considered as compensation for an emergency period and not in any way considered as establishing a value for the property.

The operation of the property is to be continued on a basis of efficiency relatively equal to that of the past.

The property is to be fully maintained so as to be turned back to the company as good as when received

Appropriation from current revenue for maintenance, depreciation and obsolescence to be the same as the past—an average of 5.72 per cent on the fixed capital—amortization of intangible capital to be relatively equal to the past.

Employes' pensions, disability benefits and death benefits now in operation to be continued.

For the protection of the security holders is provided:

Payment of the interest and existing amortization charges on all outstanding securities or obligations of the Bell System in the hands of the public, including the 6 per cent convertible bonds issued Aug. 1, 1918.

Payment of dividends at the existing rate upon the share capital of the Bell System outstanding in the hands of the public.

Payment of any charges, interest, dividends or other costs on new securities or share capital issued in discharge, conversion or renewal or extension of present obligations.

BROOKLYN ELECTRICAL MEN ORGANIZE FOR LOAN.

All Electrical Interests Represented in Committee Conducting Liberty Loan Campaign.

In order that the campaign for subscriptions to the Fourth Liberty Loan will be carried into every Brooklyn home, the Brooklyn Electrical Industries Committee has been organized under the leadership of T. I. Jones, general sales agent of the Edison Electric Illuminating Co. of Brooklyn. This committee consists of Mr. Jones as chairman, M. S. Seelman, Jr., as secretary, and the following: E. W. Babcock, H. P. Erwin, H. Gerlach, J. S. McDonagh, J. C. Forsythe, H. T. Hochhauser, Louis Kalischer, J. L. Knight, W. R. MacDaniel, O. F. Quist, W. Walsh, Geo. Weiderman and W. H. Wells as publicity manager.

The committee represents every branch of the electrical industries in Brooklyn—the electric light company, the telephone company, etc., the electrical contractors, jobbers, supply men, inspectors and manufacturers. A very complete canvass is being made of every customer of the Edison and telephone companies as well as the customers of the other interests represented.

Every night two army trucks, manned by electrical canvassers, soldiers, sailors, speakers and a band, visit theaters, restaurants and cabaret shows. Each noon a truck leaves headquarters with a crew for the canvassing of the employes of industrial plants. Appointments are made in advance to speak to these men and the results so far obtained have been very gratifying.

Over 500 sets of Liberty Loan posters have been distributed throughout the city for display in electric stores and branch offices of the Edison and telephone companies.

Mr. Jones, chairman of the committee, held a meeting of the workers on Saturday, September 28, to issue final instructions to his men. Each man present was requested to subscribe before he started out on his work and 100 per cent responded.

The Electrical Committee under Mr. Jones' leadership during the Third Liberty Loan campaign secured subscriptions for over one million dollars and his committee for the Fourth Liberty Loan expects to do as well, if not better.

REQUEST FOR OFFICER CANDIDATES SENT OUT BY SIGNAL CORPS.

Technical Men Needed to Qualify as Officers in This Important Branch of Service.

At the present moment there is a shortage of officer candidates for the Signal Corps Officers' Training School. This offers an exceptional opportunity for men qualified for full military duty between the ages of 20 years and 9 months and 45 years, who have the necessary personal and educational ability to enter this branch of the service and become officers.

The duties of the Signal Corps are two-fold. First, the developing and producing of signal apparatus for the mobile army, the air service and the coast artillery. The second and most important duty is to establish and maintain communication within the mobile army and along the lines of communication.

The duties of a signal officer are many and varied. He may be assigned in connection with the development, design and manufacture of signal apparatus or he may be assigned to an outpost company where his

post is in the front line trenches. Again, his assignment may be with a radio company, a wire company, a field signal battalion or a telegraph battalion. Unless assigned to staff duty, however, he is in command of troops and as such is responsible for their welfare and instruction.

In view of the technical nature of the duties and as the appliances used for communication are principally electric, the most suitable candidates are either graduate electrical engineers with one or two years' experience or practicing electrical engineers with five or six years' experience.

Successful applicants will be inducted into the army as enlisted men and assigned as such to an officer candidates' training school, where they will receive 13 weeks' special training. If successful, at the end of this period they will be given a commission as a second lieutenant or assigned for a further course of instruction.

Applications for this service can be secured from the Chief Signal Officer, Training Section.

MECHANICAL ENGINEERS TO HOLD TWO-DAY MEETING AT INDIANAPOLIS.

American Society of Mechanical Engineers Invites Several Other Organizations for Joint Meeting.

The Council of the American Society of Mechanical Engineers will meet in Indianapolis, Ind., on Oct. 25 and 26 and in connection with this meeting an elaborate gathering of the Indianapolis, Cincinnati, St. Louis, Chicago, Milwaukee, Detroit and Cleveland sections has been arranged. The Indiana Engineering Society, the Indianapolis-Lafayette Section of the American Institute of Electrical Engineers and the Indianapolis Section of the American Society of Automotive Engineers have also been invited.

The headquarters of the meeting will be the Claypool Hotel, where also the two professional sessions scheduled and the committee meetings will be held. Members intending to go to Indianapolis should get in touch with the Local Committee and ask them to secure reservations for them in advance. The Local Committee intends to immediately issue to all members information on the cost of accommodations, on transportation, and also a copy of the final program.

As determined at the time of going to press, the program is as follows:

Friday Morning, Oct. 25.—Registration at Claypool Hotel; meeting of the Council; meeting of the Committee on Local Sections and members of the Executive Committees of the mid-western sections.

Noon.—Informal luncheon. The mayor of Indianapolis is expected to welcome the visitors and President Main to respond.

Afternoon Meeting.—Symposium on Fuel Conservation: "An Explanation of the Regulations of the Fuel Administration," by Dr. P. B. Noyes, director of coal conservation, U. S. Fuel Administration; "What the Fuel Administration Expects of the Engineers," by David Moffat Myers, advisory engineer, U. S. Fuel Administration. Discussion, in which the administrative engineers of the Fuel Administration and members of the Society will participate.

Evening.—Informal dinner at which nominee for president, M. E. Cooley, is expected to speak, followed by war pictures.

Saturday Morning, Oct. 26.—Symposium on Research; opening address by Prof. Walter Rautenstrauch, member of the Society's Committee on Research; address by Dr. W. J. Lester, vice-chairman of the Mechanical Engineering Division of the National Research Council; discussion by members of the Society; exhibition of the Liberty motor.

Saturday Noon.—Informal luncheon at place arranged by the Local Committee.

Saturday Afternoon.—The Committee is arranging a visit to Fort Benjamin Harrison, at which a large detachment of U. S. Army Engineers are stationed, and also for visits to several prominent Indianapolis clubs. Full announcement will be made on the final program.

Committee meetings other than the ones listed on this program will be announced later.

Every member is earnestly urged to be present and bring their friends. Special arrangements will be made to take care of the visiting ladies.

KANSAS CITY LEAGUE ELECTS NEW OFFICERS.

W. M. Hand Heads Ticket—Plans Outlined for Constructive Work.

The Jovian Electric League of Kansas City, at its annual meeting October 1, made plans for aggressive work during the coming year. Meetings will be held every two weeks; committees will be appointed to outline and carry on activities in the industry. The following officers were elected:

President, W. M. Hand, manager, General Electric Co.

First vice-president, J. E. Launder, president, Independent Electric Machinery Co.

Second vice-president, W. B. Satterlee, proprietor, Satterlee Electric Co.

Third vice-president, F. F. Rossman, district manager, Westinghouse Electric & Manufacturing Co.

Fourth vice-president, H. C. Blackwell, general manager, Kansas City Light & Power Co.

Secretary-treasurer, J. D. Todd, manager, Missouri Valley Electric Co.

New members of executive committee are: A. P. Denton, retiring president, Denton Engineering & Construction Co.; F. M. Bernardin, president, B R Electric Co.; Sam Furst, manager, Bryan-Marsh Division National Lamp Works; P. J. Kealy, president, Kansas City Railways Co. Hold-over members of the board are: P. L. Lewis, manager, Wagner Electric Manufacturing Co.; M. E. Bates, city electrician; J. G. Crane, assistant to vice-president, K. C. Home Telephone Co.; F. L. Funsten, vice-president and general manager, Funsten Electric Co.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS ESTABLISHES CLEVELAND SECTION.

The American Society of Mechanical Engineers has established a section in Cleveland to be known as the Mechanical Section of the Cleveland Engineering Society. The petition for this section was made jointly by members of the local society and by members of the National Society, resident in Cleveland. This new section comprises the towns or cities of Akron, Barberton, Bedford, Chardon, Cleveland, Cuyahoga Falls, East Cleveland, Elyria, Hudson, Kent, Lakewood, Lorain, Massillon, Quarryville, Ravenna, Sandusky, South Euclid, Wickliffe, Willoughby and Wooster, totalling a society membership of approximately 260 at the present time, the sixth largest in the country.

The Cleveland Engineering Society was organized in 1891 and now has approximately 1000 members, and

is known throughout the country as one of the most active and influential local organizations of engineers. The national societies of Civil Engineers, Electrical Engineers and Automotive Engineers all have organized groups in Cleveland, so that opportunities for co-operation and co-ordination of activities are manifold. Many of the officers and prominent members of the Cleveland Engineering Society are also included in the membership of the American Society of Mechanical Engineers. Upon the abilities of these gentlemen we may count to realize to the fullest extent the enthusiasm in co-operative service for the greatest good. It is hoped that papers presented at the proposed joint meetings in Cleveland may be published simultaneously in the *Journal* of the Cleveland Engineering Society and the *Journal* of the American Society of Mechanical Engineers, with mutual benefit.

The Cleveland spirit portends a growing enthusiasm in other localities, as the society is intensely interested in spreading the movement to establish sections which shall take an active part in the work of the local organization in its district.

OPEN PRICE COMPETITION OFFERS REMEDY FOR OVERPRODUCTION.

Results of System as Operated by Institute of Lighting Fixture Manufacturers.

The system of "Open Price Competition" adopted early in 1917 by the members of the Institute of Lighting Fixture Manufacturers has met with such success that it can be recommended to nearly all classes of the electrical business, according to Herman Plaut, in a recent address. Further proof of the satisfactory operation of this system can be had from the results obtained by other associations in different lines of trade.

The system in operation entails a considerable expense which may not seem to warrant its adoption at first. The results obtained from it, however, have shown that it has paid for itself many times over, not only in actual dollars and cents, but by putting the business on a much more substantial basis. Under this system, a copy of all bids is sent to the secretary of the society who keeps it on record. When any other bids are received for the same work by the secretary, all the competing contractors are immediately sent copies of all bids. Any changes in the original bid must also be sent to the secretary to be distributed. If, however, no other copies are received, the original bid is kept confidential.

From the operation of the system it can readily be seen that competition is put strictly on a basis of merit. Of course, the nature of the fixture business lends itself particularly well to such a system due to the fact that the different manufacturers specialize in entirely different types and qualities of fixtures. There is no reason, therefore, why a quality manufacturer should try to compete, on a price basis only, with a quantity manufacturer.

The principal evil found under the old system was the fact that many fixture dealers would actually submit bids at less than cost rather than lose an order, intending, no doubt, to make it up on future business which they could expect to receive from the same source without competition. This was known to the building contractors and many unscrupulous contractors would cause a fixture dealer to underbid himself by "faking" competition, i. e., stating that some other dealer's price was lower, which was not a fact. One of the most important results of the open price system has been to show the dealers that there is not nearly the competition that they imagined. In fact, it has been proven that less than 25 per cent of the business was competitive.

The operation of the system not only tends to stabilize but also to lower prices, therefore it does not conflict with the federal laws governing combinations in trade. For years prior to the adoption of this system the condition of the fixture business as a whole was very unsatisfactory. Firms manufacturing fixtures would spring up over night, live a short, indefinite life, possibly even grow to large proportions, but invariably go out of business, always showing a large loss as the final result. Then, the institute was formed and the open price competition put into effect. Immediately afterwards there was a cessation of building operations due to the war which, of course, resulted in an over-production in the fixture business and the consequent difficulties from under-selling. During this period, were it not for the organization and this system, the result would probably have been disastrous for the fixture business. As it was, the members of the institute have so far held out and today are in a better condition financially than ever.

The formation of the institute had other advantages too numerous to mention except the more important ones. It was found that the percentage received for installing fixtures was in many cases too low. Accordingly, a standard percentage was established which is now in use by nearly all fixture dealers, even those outside the institute. A study was made to endeavor to bring about any possible changes in fittings, etc., that would enable fixtures to be installed to better advantage. As a result, a list of specifications was drawn up that has since been adopted by many architects and wiring contractors and has brought about a considerable saving in building costs.

NEW YORK JOVIAN LEAGUE TO HEAR WAR VETERAN.

The New York Jovian League will have its first meeting and luncheon of the new season on Wednesday, October 16, at 12:30, in the Winter Garden of the Hotel McAlpin.

J. W. Jones, secretary of the Advisory Committee of the league, announces that at this meeting the league "will join with fitting ceremony in the commencement of the final obsequies of the unspeakable Hun, through the medium of the Fourth Liberty Loan."

The guest and speaker at the meeting will be Lieutenant John Quinney, a Canadian who has seen 28 years' military service. Lieutenant Quinney was 12 years old when he enlisted as a drummer boy. He served throughout the South African campaign and for many years was in charge of military training in the public schools of Ottawa, Canada. He won his commission in the present war, enlisting as a private in 1914. He participated with the first Canadian Mounted Rifles in the first daylight raid ever made. This raid was conducted on December 21, 1916.

Lieutenant Quinney knows about all there is to know about trench life, and his experiences are distinctly of the thrilling type.

In addition to the speaker of the day, Lieutenant John Quinney, there will be present as a guest of honor, the Honorable Charles Pope Caldwell, New York member of the Military Committee of the House of Representatives, and chairman of the two most important sub-committees on Aviation and Transportation.

Operating

Advice on Coal Saving—Manhole Cover Repairs—Condition of Conditioned Air—Economical Transformer Mounting

TERSE ADVICE FOR COMMENCING TO SAVE COAL.

At the recent meeting of the United States Railroad Administration, fuel conservation section, in Chicago, the purpose of which was to inspire in the minds of those charged with the supervision of stationary plants the importance of conserving fuel and review some of the most feasible plans for accomplishing this end, Joseph Harrington stated that the two main factors to be contended with are the physical and the human sides of the equation.

As to the human side of the matter, Mr. Harrington strongly advises the establishment of such conditions in and about boiler rooms as will give attendants occasion for respect for their work, the primary requirements being cleanliness, light and ventilation. On the physical side, and speaking of the smaller plants particularly, he advised the impracticability of elaborate recording apparatus for gas analysis, etc. Plants consuming large quantities of fuel can and do afford opportunity for competent supervision and judicious use of this kind of equipment. A small plant cannot afford expert attendance and in consequence it is out of harmony with the use of sensitive recording and measuring apparatus. In such plants, however, he strongly recommends the use of the recording draft gauge of the two-pen type, this device giving a permanent record of conditions both under the grates and in the flue; and from the record the practiced engineer can readily determine the recurrence of irregular and uneconomical boiler attendance. Wherever possible the use of platform scales for weighing the fuel is encouraged.

SELECTION AND REPAIR OF MANHOLE COVERS.

The advent of heavy fast-moving mechanically-propelled vehicles has increased the loading to be borne by roads and highway structures very materially in recent years. Manholes, their roofs and sides and also their covers now have to be sufficiently strong to withstand the heavy weights of heavily loaded trucks that pass over them at high speed. The question therefore as to existing designs of manhole covers, whether they are capable of standing up under the stresses due these suddenly-applied loads, is a point that deserves consideration in some of the cases where construction has not, perhaps, kept up with the progress in highway traffic.

Manhole covers have broken under the suddenly applied loads placed upon them by heavy trucks thundering along, resulting in damage suits, damaged manholes and other kindred troubles. However, the broken manhole cover is comparatively rare. On the other hand, cracked covers are not infrequently met with. This is more prone to be the case with covers that are square than with circular covers, because of the distribution of stresses in the former. The repairs usually required by manhole covers consist of replacing worn down flanges and rims, and repairing cracks. The same applies to cover frames in which the covers rest when in place.

The scarcity of metal, the high prices and shortage of labor and delays incident to obtaining deliveries from foundries, have all acted as incentives to central-station companies to repair their own manhole frames and covers. The above-mentioned defects are readily repaired by welding, using either the oxy-acetylene flame or the electric arc, according to circumstances. Repairs made by welding show considerable saving over the cost of taking the cover or frame to a foundry for repairs or scrapping it, which may necessitate digging up the road. One company, with existing prices, estimates that by welding its broken frames or covers it is able to save between $20 and $25 at an expenditure of $5, while at the same time lessening the amount of work done by the underground department.

CONDITION OF CONDITIONED AIR.

Precautions to Be Observed and Methods of Observing Them.

By Marmion A. Lincoln.

The practice of conditioning air for cooling turbogenerators is a common one. The air may be washed, and thus cleaned and humidified, by passing through water sprays, although there are other ways of filtering and cleaning air which are less satisfactory or beneficial than the use of water sprays, as, for example, cloth screens.

Whatever the form of air treating apparatus employed, it is always wise, and often imperative to be able to determine the condition of the treated air, whether it contains moisture and to what extent dirt and dust has been removed. One method, a very rough one it is true but also a very simple one, consists of inserting a cotton screen in the direct path of the air. The quantity of dirt picked up by this screen can be determined either by appearance after a definite period of time or quantitatively by weighing. A comparison of screens in the path of the filtered or conditioned air and the unconditioned air serves to show immediately to what extent the conditioning is effective or worth while.

Another method of reaching a conclusion as to the condition of air being passed to a turbogenerator, which does not constitute the fire hazard that do the cloth screens, is to use a strong beam of light. The

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light is arranged so that its rays pass across the path of the rapidly moving air in the air-duct, which is darkened. When viewed at right-angles to the path of light, impurities in the air are distinctly visible. This method, simple and permanent, has the objection that a quantitative determination is not possible, nor it is possible to differentiate between dirt and moisture. The method does, however, differentiate between various conditions of air from time to time due external causes. To adopt this method of watching the air it is necessary to install the light unit so as to throw its beam of light across the duct, also a glass window through which the observer may make his observations.

Moisture in suspension in the air is more objectionable than dirt because it may cause rapid dielectric failure of generator windings, or grounds, whereas the dirt results in gradual accumulations which interfere with heat dissipation until final overheating takes place if not prevented by periodic cleaning. Whether the air being carried over into the generator contains moisture can be determined quite readily by installing a piece of thick glass in the path of the incoming air. Moisture, if present, will deposit upon the glass, thus making its presence known. When passing a glass plate into the air duct to make the above determination, care should be taken that the temperature of the glass is not below that of the air, and preferably somewhat above lest condensation occur, giving a wrong indication.

ECONOMICAL TRANSFORMER MOUNTING.

Arrangement Effects Low Secondary Drop, Easy Mounting and Economy of Material.

By L. A. Sims.

A voltage of 220 volts is one of the standard secondary voltages employed for three-phase power. With large loads, relatively speaking, and low power-factor the voltage drop even at this voltage may be troublesome and with long distances of distribution, as may obtain in industrial plants covering considerable floor space.

The transformer mounting shown in the accompanying illustration is one that possesses several features that recommend it, one of which is that the secondary voltage drop may be kept to a minimum. The installation consists of a three-phase transformer of 100 kw. and a 10-kw. single-phase lighting transformer. The lighting transformer is mounted at the usual height above the ground. The three-phase power transformer, however, is installed only about 8 ft. above the sidewalk, resting upon a platform supported on the one side by the pole, and on the other by a shorter pole. In passing, it is interesting to mention that the shorter pole supporting one end of the transformer platform was obtained from an abandoned pole.

The single-phase transformer is protected by a lightning arrester, as is also the three-phase transformer by three lightning arresters. The enclosure seen at the right hand side consists of sectionalizing switches and metering appliances.

Installing the heavy three-phase transformer close to the ground reduces the trouble and cost of installing, and replacing it whenever the occasion arises for doing so. The susceptibility to lightning is somewhat reduced due the lower elevation. The shorter length of service conductors from transformer to load results in less secondary drop, in which power-factor is an important factor. In the present instance the secondary leads are able to pass through the building wall and in the same plane traverse the ceiling of the machine shop, seen on the left-hand side, which supports them. The above method of installing large power transformers is at once convenient and inexpensive.

Interesting Mounting of Large Three-Phase Transformer.

RENEWABLE BRAKESHOES FOR INDUCTION REGULATORS.

Brakes are installed on induction regulators to bring the rotor to rapid stop and thereby prevent coasting and over-shooting, improving the voltage regulation and reducing wear and tear on the regulator motor and its controlling mechanisms. These brakes are of various types; for example, they may be dynamic brake, solenoid operated, the brake going on as soon as the potential goes off, or they may be of the constant torque type—on all the time.

In one Middle West central-station company several hundred of these induction regulators are employed. The majority of them employ the constant torque type of brake, which uses a cast iron brake drum and a leather shoe. These leather shoes are riveted to their holders with copper rivets. In course of time the leather wears away and the holders foul the drum, the leather becomes polished and the friction between drum and shoe such that overshooting and coasting of the rotor occurs, causing burning of contact-making voltmeter contacts, impaired voltage regulation and overheated motor.

To replace the leather shoes it is necessary to drill out the rivets, replace the leather and affix to the holder. Instead of using rivets, as is done originally, it is preferable to use bolts. The bolts permit the leather of being changed rapidly and cheaply, and when it suffices, of the leather shoes being interchanged instead of scrapped or left alone until useless. Central-station companies finding it necessary to replace these leather shoes will find it advantageous to employ bolts instead of rivets, and it is suggested manufacturers might also discard the use of rivets to advantage.

Contracting-Construction

Safety Fuse Pullers and Protectors—Joint-Taping, Plastering and Battery-Terminal Kinks—Among the Contractors

SOME SAFETY SUGGESTIONS FOR THE MAINTENANCE ELECTRICIAN.

Designs for Fuse Pullers and Protectors and Guard for Motor Starter.

BY A. GEMMELL.

When electrical apparatus is being installed there are many little things that should be looked into to help the men that maintain such apparatus. For instance, such things as placing cutout boxes where they can be got at quickly and not placing them near a network of pipes, as plenty of room is needed when new fuses are being put in. It is not uncommon to find cutout cabinets placed high up on a wall or on the ceiling and as near the feed wires as possible. This means that a ladder has to be used to reach them, which makes it all the more necessary to have them free from obstructions when testing or replacing defective fuses. I have known of a few cases where clamps on the ends of feed wires were not taped at all, on account of the parties installing same, thinking

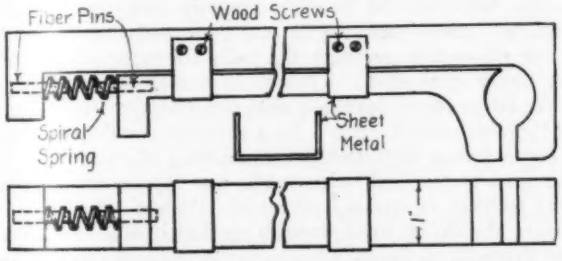


Fig. 1.—Side and Plan Views of a Convenient Fuse Puller.

that it was unnecessary to do so because the wires were out of reach of everyone; but many times carpenters, plumbers, etc., have to make repairs or changes and are liable to come in contact with them. A little extra time will make it safe for all.

Fig. 1 shows a device I have used as a fuse puller for handling large fuses. This will be found a good one when putting in fuses and there is only a limited amount of room between the fuse clips and the box. If the fuse should happen to slip sideways so as to bridge between the live side of the cutout and the box, it means a ground and violent flash which arc has been known to jump across to the other wire and burn the electrician badly and even cause him to fall. If a good strong spring is used in the fuse puller, when the fuse is placed in the jaws there is very little danger of the fuse turning sideways. The spring should be put in place first and then the sheet-metal guides are put on. It is still better to make the guides of fiber and countersink the screws, covering them with insulation. If the puller is made of fiber it is best, although paraffin-filled hardwood will do quite well.

Fig. 2 shows another type of fuse puller for small fuses up to ¾ in. in diameter and this can be carried around with your pliers and screw driver during the working period and will be found useful a great number of times, especially where electricians are "trouble shooting" in factories. It can be made of fiber or hardwood and the ends followed out for different

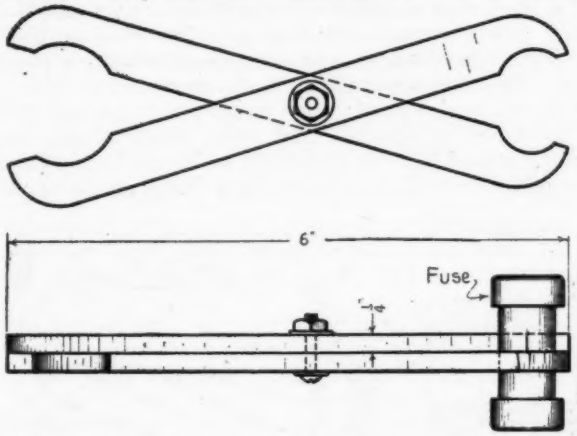


Fig. 2.—Side and Plan View of Another Type of Fuse Puller.

sizes of fuses. Keep the screw tight and upset the screw end a little so that the nut cannot work loose.

Fig. 3 shows a safety device for protecting men when putting in new fuses on motor circuits or when inspecting or cleaning motors. Cases have been known where parties have been injured by some one starting the compensator, not knowing that men were

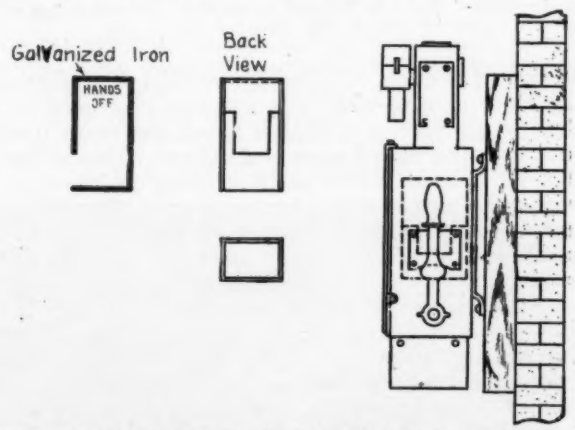


Fig. 3.—Side View and Details of Safety Cover for Motor-Compensator Handle.

working on some parts of the apparatus. Some persons will say that the handle should be tied or that some one should be left there to see that nobody touches it, but this cannot always be done. If a cover is used like that shown in the sketch, the workman can rest assured that everything will be O. K. until he has finished. The dotted lines show the cover in place which now completely covers up the handle and pre-

vents tampering with it. "Hands Off" or "Danger" can be painted on the side facing the operator. Even if a man cannot read, when he sees the handle covered up he will know enough to leave it alone. This is simple to make and, if made right, it will fit several sizes of compensators.

In Fig. 4 are shown several methods for keeping fuses from falling out of the clips and against the cutout box cover when the box is situated on the ceiling, on beams, or in other positions where it is facing downward. The fuses will gradually slip out, if there is considerable vibration, and this throws a ground on the system and also causes needless interruption and trouble. *A* shows a style of block that is used quite a little; it is cut just long enough to slip in snugly. *B* is one of the best methods I have tried. It consists of a block that should be riveted to the cover, and the rivet heads countersunk deep into the wood or fiber and the holes filled up with some good insulating wax. This block will always keep the fuses up snug. *C* is a style that is also good; when putting on the spring use a stout one, if possible, and when installing put the spring end of block in place first and press in and then the other end will just slip over the flange on the opposite side of the box. *D* shows a method that takes a little more time to make, but will also give good results. When putting it in place loosen the screw then shove over the slotted piece and tighten. This holder is O. K. in boxes where there is plenty of room between the fuses and top of the box, as the sliding piece makes it thicker. When using holders *B* and *D* make it a practice to keep the screws or rivets as far away from the fuses as possible, or better yet cover them and there will be no danger. These methods will be found practical and will save time and trouble when put into effect. It will be all the better if fiber is used for both fuse pullers, and good hard wood, well seasoned, for the holders. Soak the wood first in paraffin, or give it a couple of coats of shellac. This will keep out moisture when used in damp places.

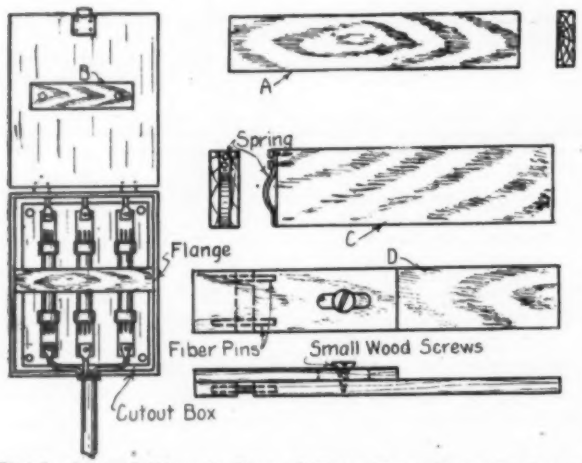


Fig. 4.—Several Ways to Prevent Fuses From Dropping Out of Clips in Cutout Box Mounted on Ceiling.

TAPING A PIGTAIL JOINT.

By Arthur S. Nickerson.

The correct taping of pigtail joints, in conduit work especially, is a matter of importance. The writer has found that the following method, properly followed, will give very good satisfaction. Wrap rubber tape, half-wound, on joint when it is still in the original position. After placing the joint in the final position another half-wound wrapping of rubber tape and a final wrapping of friction tape should be put on. By this method all parts of the joint are assured proper insulation and the joint can be moved around with less danger of breaking through the insulation.

A PLASTERING KINK.

By W. F. Perry.

The electrician is frequently required, in the installation of wires in finished buildings, to cut holes here and there through the plastered walls or ceilings. Before these holes can be replastered, some sort of a backing must be put in which will take the place of the lath. The majority of men make use of old rags or paper for this purpose.

The writer, in replastering holes, uses a backing of ordinary wire screen. This wire should be cut about ¼ in. larger than the hole to be filled, and when pressed into it, it will be found to make a good stiff backing as the edges hold it firmly in place. Far less plaster will be necessary with this backing than with the others, which will cover the cost of the wire screen, and a more workmanlike and durable job is obtained.

DECREASING THE CORROSION AT STORAGE-BATTERY CONNECTIONS.

By A. Gemmell.

In spite of the vaseline usually put on storage-battery connections, the wires, eyes and lugs and the brass studs that connect the cells together sometimes get badly corroded. This is especially true when a loose connection develops and the vaseline melts, due to the subsequent heat. As a remedy for this trouble, I have found that before connecting up new sets, if the feed wires and brass studs are dipped into solder this trouble is greatly reduced. When dipping, the solder should be fluid enough so that it will not fill up the threads.

AMONG THE CONTRACTORS.

The Keystone Electric Supply & Construction Co., Washington, Pa., has received a contract for electric work in connection with a new building to be erected by C. L. McKee, at a cost of $25,000.

In connection with the new theater building being erected on Main street, near Eighth street, Los Angeles, Calif., by Col. J. B. Lankershim, contract for electrical work has been awarded to the Forve-Pettibone Company, of Los Angeles.

The Los Angeles office of F. E. Newbery Electric Company has been awarded a contract for the electrical work in connection with the new building now in course of construction on Grand avenue, between Sixth and Seventh streets, in that city.

The Standard Electric Company, Seattle, Wash., has a contract for installing electric power equipment in the plant of Puget Mill Company, at Port Gamble, on Hood's Canal, an arm of Puget Sound. The equipment comprises a steam turbine and generator, and 72 motors. The contract includes wiring the building for light and power. Allis-Chalmers equipment is to be installed.

Contractor-Dealer

Slogans for Selling Electrical Appliances—Stewart Electric Repair Shop—Consideration of After-War Conditions

TEN COMMANDMENTS OF APPLIANCE SELLING FOR ELECTRICAL DEALERS.

Pertinent Suggestions Offered by Society for Electrical Development to Capitalize on Present Opportunities.

The October number of the Monthly Sales Service, the organ of the Society for Electrical Development, Inc., contains many slogans which can be used by dealers to increase their own business and at the same time further the interests of our Government. It also contains some useful advice on the Convenience Service Outlet campaign with suggestions for estimate and proposal forms, which can be used by contractors who are pushing this campaign. A timely start is given to the Christmas holiday sales effort to have the buying period this year, if ever, extended over as long a period as possible. It contains a large number of sales ideas cleverly presented for use by dealers and the ten commandments of appliance selling which are as follows:

1. Know your appliances—what they will do and how they do it.
2. Know your customer.
3. Aim to discover and cater to the prime desire that prompts the customer to buy an electrical appliance.
4. Keep away from talking watts, amperes, volts, and so on.
5. Don't refer to electrical appliances as "current-consuming" devices.
6. Always refer to operating cost of appliances in terms of cents per hour.
7. Show appliances in actual operation.
8. Don't invite consideration of too many appliances. Attention must be concentrated upon one appliance before a purchase is made.
9. Aim always to display the best make of appliances first.
10. Attach to appliances tags showing the price and cost in cents per hour to operate.

OPPORTUNITIES FOR CONTRACTORS IN REPAIR WORK.

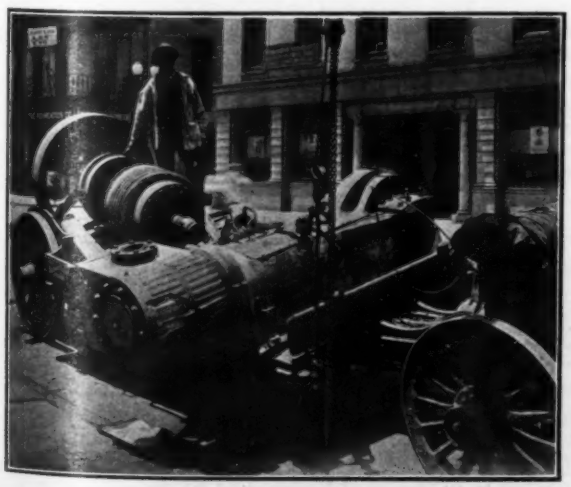
Growth of New Orleans Company Indicates Big Possibilities in This Field—Views of Important Work.

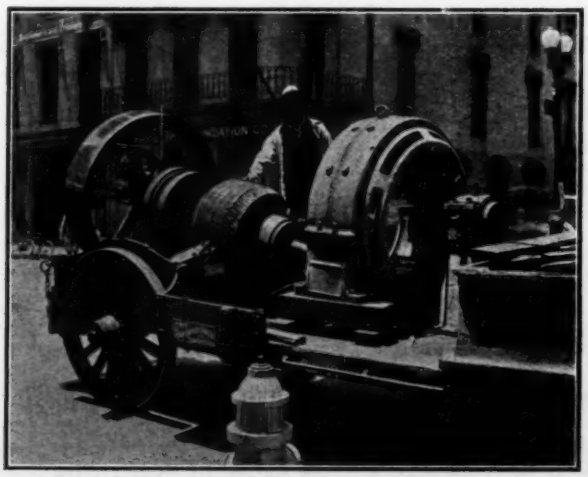
In the ELECTRICAL REVIEW for February 16, 1918, there appeared a brief account of a model electrical repair shop operated by the Stewart Electric Company of New Orleans, La. It was pointed out that this establishment, which had developed the maintenance and repair department to considerable proportions, emphasized in a striking manner the opportunities that existed for electrical contractors to increase their profits by adding repair work as an adjunct to their present business or by the making of special efforts in this line by firms already having repair departments.

In New Orleans, like in many other localities, the unprecedented high costs of new electrical machinery, coupled with Government restrictions and delays inherent in securing delivery, have resulted in a harvest for the well equipped electrical repair shop having facilities for repairing, rewinding and rebuilding motors, generators, etc. The Stewart Electric Company has taken full advantage of this situation and when other contractors were bemoaning the lack of new construction work, this company was continually enlarging its repair department to take care of its rapidly expanding business.

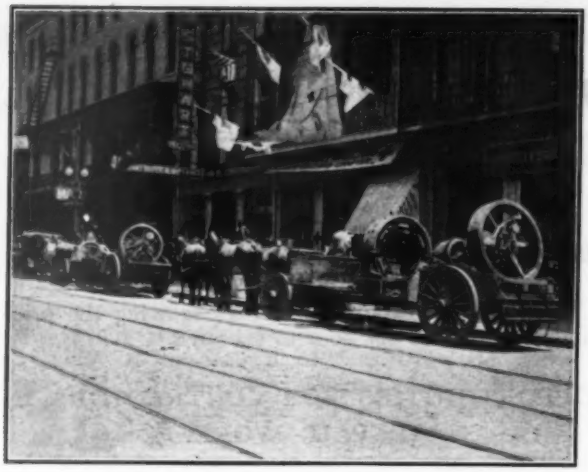
The extent to which this phase of the company's work has developed may be gained by reference to the accompanying illustrations which show machines being delivered for repair. From a small shop for handling only small jobs the Stewart plant has grown to such

Safe as the United States. Buy Liberty Bonds.





Views of Two Shipments of Equipment Being Delivered at Shop of J. S. Stewart (Electric), New Orleans, Indicating Character of Work Being Handled at This Plant.



Exterior of Stewart Repair Shop in New Orleans Showing Heavy Machinery Being Delivered for Repair.

proportions that any class of work can be handled. The significant feature of the delivery pictured is the size of the work which the company now undertakes and is able to handle satisfactorily and efficiently.

WHY ELECTRICAL DEALERS SHOULD CONSIDER AFTER-WAR CONDITIONS NOW.

By J. S. Older.

Electric appliance and electrical supply dealers are anxiously awaiting the time when building operations will be resumed. This in all probability will not be until after the war has been won.

But, just exactly what will happen immediately after the war? First of all, there will be a period of readjustment. Hundreds of thousands of men who are now doing war work will go back to the work they did before the war. But this requires time. The factories themselves will necessarily have to be readjusted to the schedule before the war. In many instances manufacturers will take up new lines, requiring the installation of new machinery before the work can be started on a definite schedule. Then, too, sales organizations everywhere will show renewed activity. Some of the old-time manufacturers will suddenly find that their former customers are now buying elsewhere and the business will to a great extent have to be built practically from the ground up.

Competition, too, will be keener. But with it all, there is every indication that there will be work for all and a market for every wide-awake manufacturer who goes after business with the proper zest, the proper enthusiasm, and with the same determination that was displayed when war work was first scattered broadcast, effecting practically every large manufacturer in the United States.

The volume of advertising will be greatly increased and dealers will be bombarded with salesmen as well as directly by mail circulars, catalogs, broadsides, etc.

The electrical supply dealer who waits for the resumption of building operations will not be in the majority. Wide-awake dealers throughout the country will begin an active sales campaign immediately after the war is won and one of the biggest fields for sales will be found among the middle class. These are the people who have been buying Liberty bonds and War Savings stamps to the extent of their ability.

This will mean that thousands of people will suddenly find themselves with more money than they have ever before had at one time. They will feel prosperous and one of the first things they will think of will be to make their home more attractive, more comfortable and more desirable.

Electrical dealers at this time should have little difficulty in selling large quantities of all sorts of electrical appliances, from toasters to washing machines and cooking ranges, from door bells to electric lighting fixtures.

At that time it is more than likely that Liberty bonds will be selling at or above par, and merchants everywhere will be advertising the fact that they are accepting Liberty bonds the same as cash. Merchants would be doing this today were it not for the fact that Uncle Sam has expressed a preference that the original Liberty bond buyer be allowed to hold on to his Liberty bond investments until after the war.

Another important factor will be the returning soldiers. Thousands of young married men who are now in France or in training camps will want to begin housekeeping immediately on their return. There are thousands more who have delayed marriage because they were in the draft. These also will look forward to the time when they can establish a home of their own. Then, too, there are the many young girls who have seen their chances of marriage materially reduced as more and more of the young men entered the services of Uncle Sam. Once the war is over and the victorious boys come marching home, their courage will come back; the returned soldiers will be heroes and many of them will go to the altar, for better or for worse, until death or divorce part them.

Of course, all of these soldiers will not come home at the same time. It has been estimated that with all the ships Uncle Sam will have at his command, it would require at least a year to bring back 2,000,000 men.

Some people have expressed the opinion that there may be considerable idleness immediately after the return of the soldiers. This, however, has been contradicted by various authorities and there is every indication that these returned soldiers will readily find employment as soon as mustered out of the United States army. In fact, it has been said that as a whole, the positions they will find will in every way be better than those they left before becoming Uncle Sam's fighting men.

There is no doubt but that there will be more electrical work immediately after the war than ever before. But also, there will be more electricians than ever before. Thousands of young men in Uncle Sam's army have had an opportunity to learn something about electrical work. Many of these came from the farm or had no special trade. It is comparatively safe to assume that many of these will make use of what they learned while working in war plants or while helping electricians on the front line of battle.

ALBANY COMPANY PLACES 84 ELECTRIC RANGES IN FIVE MONTHS.

The Albany (Ore.) division of the Oregon Power Co. has placed 84 electric ranges on its lines since May 1, as the result of a systematic canvass among prospects. This makes a total of 160 electric ranges now served by the Albany division. F. D. Barrett, new business manager of the company, finds from statistics that the average monthly cost for electric cooking is in the neighborhood of $3.00.

Electric Vehicles

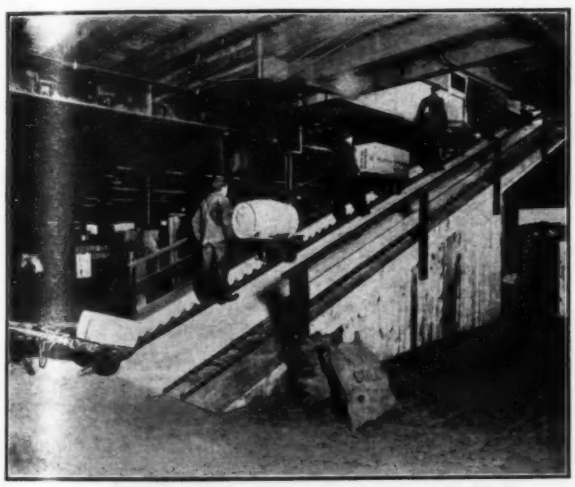
Railroads Use Tractors—Light Delivery Costs—Tractors Relieve Railroad Congestion—Electrics for Civic Service

TRACTORS HELP A RAILROAD.

Data of Performance Proves Value of Electric Tractor.

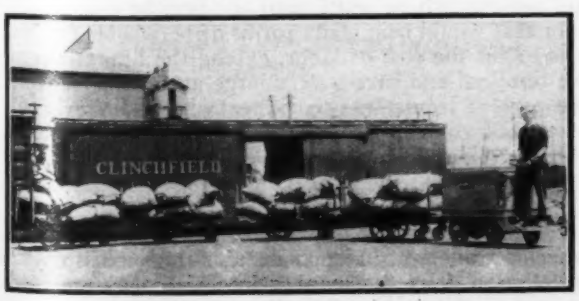
The railroad locomotive knows no 8-hour day. The passage of freight along the railroads goes on hour after hour, although the train crews change shifts, as also the workers at the freight terminals and elsewhere. However, the less manual effort required the longer can effort be sustained, the longer can work go on, the more intense can it be, and the lower its cost.

An instance of what can be accomplished by man power and mechanical effort is that given by a large railroad that adopted storage battery tractors for freight handling. During the daytime two tractors were employed for hauling trucks of freight. Eleven



Saving Man Power at a Terminal.

gangs of men did the handling and the average amount of freight handled per man per day was in the neighborhood of 20.5 tons. During the night four tractors instead of the two used during the day were employed and it was found that five gangs of men sufficed instead of the 11 during the day; and that the fewer men handled an average of 24.7 tons apiece instead of the 20.5 tons handled by the larger gangs with the fewer tractors.



Storage Battery Tractor Doing What Men Formerly Did.

This same railroad, at another of its freight terminals, at one time employed 132 truckers. Then storage battery tractors with trailers were adopted. Today the 132 truckers have been replaced by only 73 men who are able to handle 500 tons of freight a day, whereas formerly the 132 men had handled less than half this amount. The storage battery truck and trailer makes men available for national service, saves trouble and speeds up results.

In considering labor-saving devices for industrial plants, freight terminals and wharves, efficiency engineers and others will find a promising and vast field in the utilization of storage battery tractors, motor-operated inclined elevators for hand trucks, belt conveyors, telphage systems and moving platforms.

LIGHT DELIVERY VAN COSTS.

In advocating the electric vehicle for general haulage purposes, great emphasis is often placed upon the ability of this type of vehicle to travel at low speeds under heavy loads. Of late there has been a tendency to recommend the light type of electric vehicle for parcels delivery, collection and distribution of laundry, groceries and similar work that might be classed as light transportation at higher speeds.

At the present time when so much attention is being given the matters of eliminating horse feed, replacing men by women, hastening work and thereby reducing the number of vehicles and drivers, the actual performance of a light electric van should be of special interest. It might be pointed out that since the gasless Sundays came into vogue the electric vehicle has become a vital factor in certain classes of transportation and has opened the eyes of those that doubted its use. The van in question was run continuously for 30 working days, during which distance traveled and energy consumed were carefully recorded. The work comprised the delivery of light city delivery and cost as follows:

Period of test	30	days
Distance covered	1140.5	miles
Average per day	38.01	miles
Total energy consumption	319.5	kw-hr.
Average energy consumption per day	10.65	kw-hr.
Average energy consumption per mile	3.57	kw-hr.
Average load carried	1008	lb.
Cost of energy per car-mile, at 2c per kw-hr	0.56c	
Cost of maintenance (estimated) per car-mile, embracing repairs, renewal of all mechanical and electrical parts, tires, battery, etc	4.0c	

The above operating costs do not include the cost of garaging, insurance, the expense for a driver, nor interest on the investment. However, the above permit of a comparison being made for horse-drawn vehicles or gas vans for similar service.

Bonds Win Battles. Buy More Bonds.

Send the Ammunition Over. Buy Liberty Bonds.

Industrial Tractors for Solving Freight Terminal Congestion

Traffic Congestion, Labor Shortage, Waste, Loss of Time and Greater Dispatch of Freight Brought About by Doing Things Electrically

The substitution of mechanical for manual methods of handling freight and materials generally has made rapid headway of recent months under the severe conditions and unprecedented situation created by the war. The amount of material to be handled has increased many fold, the man-power for handling it has decreased, creating congestion, confusion, loss of time and spoiled goods. In many terminals freight has piled up until removal has become almost impossible, because man-power has failed because of weaknesses inherent to man.

What applies in the freight terminal, and the same situation exists to a lesser degree in vast numbers of industrial plants, stores, transfer houses and sheds throughout the country, applies also to yards and wharves outside where the inability to load trucks rapidly, the slow movement of horse-drawn vehicles and the large amount of space occupied by them has added to the confusion. Man power must go, horse power must be replaced in busy centers where freight and material is to be moved by mechanical propulsion, if transportation and shipping charges are to be kept down, if material is to be kept on the move efficiently, if transportation and movement of materials is to be placed upon a scientific basis.

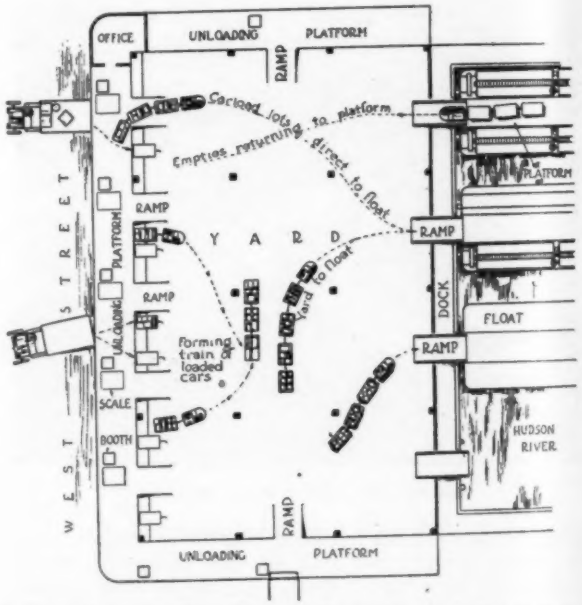
Improvement of conditions as they exist very largely in all railroad centers and places where freight is interchanged, consists of utilizing gasoline and electric storage battery trucks for road-borne freight moving from depot to depot, from town to town or from one part of a town to some other part. For improving conditions within the industrial plant, freight shed or terminal, where the haul is short and usually performed by man or animal power, the remedy consists of adopting mechanically hauled trailers and tractors. These tractors can, of course, be propelled by any form of mechanical device—gasoline engine, oil engine, electric motor. The choice depends upon the fire hazards, the safety, reliability, economy, cost of operation, and so forth, and on all of these except initial cost, perhaps, the electric storage battery tractor has proved itself supreme.

Perhaps the effect of railroad congestion never made itself more widely felt than was the case early this year along the Atlantic seaboard, where freight congestion and crippled railroads caused a coal situation and freight fiasco that was felt to the Pacific Coast. Mention of what has been accomplished at one of the large freight terminals in New York may therefore serve to show what can be done in the way of reducing freight congestion, conserving labor and accelerating freight movement by the inauguration of mechanical methods of freight handling.

What One Railroad Accomplished.

At Pier No. 4, at the freight shed of the Pennsylvania railroad, situated on the lower Hudson river waterfront, four small electric industrial tractors were placed in service. A number of old four-wheel trailers (the exact number was 225) that had been formerly used were rebuilt for use with these four storage battery tractors, and these likewise were put to work with the tractors. And what was the result? The result was, and almost immediately, that whereas by the old method of handling and re-handling freight 165 men were required to move about 25 carloads of freight across a platform into or from cars, now only 100 men are required to load, not 25 cars, but 40 cars with some 440 tons of freight. And this is done in the same time that 25 cars had previously been loaded by the 165 men.

The immediate result of adopting these four storage battery tractors which do not in any way consti-



Cross-section and Floor Plan of Pennsylvania Railroad Company's Freight Terminal, New York City. Pier No. 4.

tute a fire hazard or constitute a danger of asphyxiating persons where ventilation is poor, or give off an odor that would ruin many forms of perishable freight, was to cut the cost of labor, extend the limitations of the terminal and save a very large amount of time on the part of teamsters—truckmen who had previously often had to wait around for hours until they were able to collect or deliver their consignments.

Operating Methods Important Factors.

While the electric industrial tractors and the four-wheeled trailers are responsible for the success of the installation, it is the manner in which they are used

rather than the mere equipment itself that has made possible the great savings secured. In the first place, the shape of the unloading platform has a great deal to do with the successful operation of the plan, and in the second place, the manner in which the trailers are disposed so that there are always some to be loaded and in such a position that they can be loaded with the minimum amount of human endeavor.

In short, the entire headhouse of the pier between the street and the inner end of the slip between the

Tractor Hauling Train of Trailers Along Freight Terminal.

two adjacent piers which jut out into the Hudson is given over to a two level unloading platform and tractor and trailer yard. The headhouse is approximately 125 ft. long on the front and extends back about 75 ft. The unloading platform is in the shape of a huge U with a 175-ft. base and two 75-ft. uprights.

The wagons and motor trucks can back up on all three sides of the U so that the number of vehicles which can find a place to back up to the platform is more than double the number which could be accommodated were they able to back up only to the front, as is usually the case at most piers. Thus this pier, with a front length of 125 ft. on the street and 75 ft. on each side, has a total tailgate space of 275 ft. as compared with the 125 ft. if loading were only permitted from the front side.

The U-shaped unloading platform, which is 20 ft. wide, is at a higher level than the rest of the floor of the headhouse. The platform is level with the tailgates of the wagons or motor trucks which back up against it in order that the goods may be rolled off the vehicle bodies with the least amount of physical exertion on the part of the drivers or helpers. The yard of the platform or that portion inside of the U-shaped unloading platform is about 20 in. lower than the platform itself and is reached from the platform by means of nine inclined ramps, four on the front side of the U and two on each of the two arms.

Trailer Platform Level with Unloading Platform.

The trailers, whose loading platforms are 20 in. off the floor, are lined up endways along the entire inner edge of the unloading platform between the nine ramps. Since their load platforms are 20 in. above the floor and the floor of the yard is in turn 20 in. below the platform, the trailer platforms are flush with the unloading platform. This enables the goods to be loaded directly onto the trailers from off the unloading platform without lifting. Since the floor of the yard is graded up slightly toward the inner edge of the unloading platform a 4-in. moulding is tacked down on the yard floor the length of the trailer wheelbase away from the inside edge of the platform, this moulding chocks the trailer wheels so that the trailers are automatically held up against the edge and may not be pulled out of position except by the tractors.

The long base of the U-shaped platform is used to unload general merchandise while one of the side arms is employed for carload shipments and the opposite side for transfer goods.

Details of the System Operation.

The operation of the system, which was worked by M. Townsend, agent of the pier, may be briefly described as follows:

Small shipments are unloaded from the wagon or motor truck onto hand trucks which are then placed on one of the nine automatic scales set flush with the platform floor. Each scale is alongside of a closed-in receiving booth with a door for the entrance of the shipping clerk and a window to enable him to check goods as they are brought to the scale for weighing. After being weighed, the merchandise is given a designation number which corresponds with the number of the freight car on which it is to be shipped to reach its designation as routed. These same numbers are always used for those particular cars so that the freight handlers soon familiarize themselves with them and need not be told where a certain numbered car is to be routed. Each piece of merchandise is also marked "P. R. R. No. 56," which is the number of Pier No. 4 station. This tends to identify goods which have for any reason gone astray.

The hand truck is then pulled across the platform floor to one of the trailers and the goods unloaded onto it. Suspended from the roof beams directly above each trailer is a metal number plate corresponding to that of the freight car to which the goods put on that particular trailer are to be carried.

After the trailers have been fully loaded, they are drawn from the edge of the platform and down into

Unloading Boxcars and Making a Small-Radius Bend.

the flat yard, where they are later marshalled into trains of from three to six or more. After a full train has been made up, the electric tractor draws it out through one of the four gates in the partitions dividing the waterside of the headhouse from the inside end of the slip and up on a ramp onto the platform on the car-flat between the two lines of six cars each.

As the tractor runs down the car-flat platform it drops off the trailers as it passes the doors of the cars on which the goods they carry are to be loaded. Each trailer is then pushed inside of the freight car by stowers who unload it and pack the freight into the car. The empty trailer is then pushed back on the platform and later picked up by the tractor on its return trip and carried back to its former position up against the unloading platform under its proper number.

CARLOAD SHIPMENTS LOADED DIRECTLY ON TRAILERS.

For carload shipments, the goods are unloaded directly from the wagon or motor truck onto trailers which have been pulled up the ramps to the platform because they may be loaded at one operation. After they have been loaded, they are taken over the automatic floor scales and weighed, after which they are handled in the same manner as the l. c. l. shipments.

The yard is under the supervision of a dispatcher, yardmaster and an assistant. These men are held responsible for the handling of the tractors so that there are always about 50 empty trailers up against the edge of the platform ready to be loaded so that there will be no delays in loading such as would cause the unloading platform to be congested.

The four tractors used are three-wheeled Mercurys, made by the Mercury Mfg. Co., Chicago. They are equipped with Edison type G9 storage batteries which are re-charged at noon and night at a special charging station fitted up on the pier property.

If this method of handling package freight were installed in all of the terminals of our larger cities, the freight cartage men would be relieved of their greatest problem. For many years it has been next to impossible to earn a fair return on investment and effort in this phase of the transfer business because the freight transferman has not been able to plan his work expeditiously. He has been unable to figure accurately the time necessary for each rig to deliver its load to the railroad, and hence, could not plan the work for the balance of the working day. This system described on Pier 4 takes care of the freight as fast as the rigs bring it to the receiving platform and releases the team or motor truck within a short time for further work. If this system were universal, the hauling equipment of the transfer companies could be reduced materially at a great reduction in overhead expense.

BRITISH MUNICIPALITIES TAKING TO THE ELECTRIC VEHICLE.

Although the shortage of labor has been felt here, conditions are very different to those existing in Great Britain, where every industry and calling has been combed out almost to the limit in the endeavor to find men for the army.

Naturally, and we say it advisedly, civic authorities and municipalities turn to the electric vehicle as the best means of reducing the serious effects of labor shortage, scarcity of materials and high costs. The adoption of the electric vehicle has increased between 500 and 800 per cent in Great Britain in the last two years or so, and the number of electrics going into service, on order or under advisement, continues to increase at a pleasing rate. Latest reports tell of many interesting cases where the electric truck is either ordered or about to be ordered. Inverness has ordered two electrics for garbage disposal at a cost of about $5960 apiece, while Cardiff expects to follow suit. Edinburgh is considering the adoption of electric vehicles for street cleaning and collection of refuse, in place of horse-drawn vehicles now found too slow, too expensive and troublesome. Glasgow Corporation, famed for its street car system and civic efficiency the world over, has recently ordered a 5-ton tipping wagon that will cost in the neighborhood of $8500. In three other cases have a 3½-ton, a 2½-ton tipper truck and one 2-ton wagon been ordered for municipal service.

The activity in taking to the electric vehicle in Great Britain has come about of necessity, resulting from the war. On the other hand, those in a position to know have felt that conditions after the cessation of hostilities will never be what they were before the war. Laxity, waste and inefficiency will have to go. Old-time methods will have to give place to modern methods. Therefore, an electric vehicle bought now, to help conserve coal, foodstuffs, labor, and so forth, in these hours of stress, will remain when the war is won to serve its purpose of efficiency and economy.

Liberty Bonds will liberate the world of the kaiser's kultur.

LIVING COSTS UP 64 PER CENT SINCE 1914.

Living expenditures increased 64.88 per cent in August, 1918, over and above similar expenditures in December, 1914, according to a report of the Bureau of Labor Statistics on a special inquiry into Chicago conditions.

The investigation conducted in co-operation with the wage adjustment board of the Emergency Fleet Corporation involved 215 Chicago families. The report shows:

Average expenditures per family for clothing were $210.70 a year—man $118.80 and woman $91.90.

The percentage of cost of clothing per family was 14.35. The percentage of increase in the chief necessities was found to be as follows:

	Dec. 1916.	Dec. 1917.	March. 1918.	Aug. 1918.
Furniture and furnishings	19.96	47.45	87.04	96.28
Food	25.23	53.42	48.83	69.81
*Housing	.70	1.36	2.08	3.06
Fuel, light	6.64	19.34	30.82	37.41
Miscellaneous	19.51	41.78	49.06	64.88
Man clothing	26.53	51.01	88.36	103.94
Women's clothes	21.22	50.03	88.70	112.26

*Decrease.

The total average living expenditures per family was found to be $1467.99, with increases ranging as follows: December, 1915, 3.01; December, 1916, 19.51; December, 1917, 41.78; March, 1918, 49.06; August, 1918, 64.88.

HYDROELECTRIC PLANT AND ELECTRIC SMELTING FURNACES BEING INSTALLED.

The Olympic Smelters, managed by H. H. Piper, Olympia, Wash., which have opened a manganese mine in Olympic mountains, are installing a hydroelectric plant and two electric smelting furnaces on the property. The electric equipment consists of two 300-kw. alternating-current generators, to be driven by two impulse wheels, Pelton type, and will produce energy for two Greene electric furnaces. The generators were rebuilt and sold by C. Kirk Hillman Co., Seattle. Shipments for this plant are made to Potlatch, Wash., there being a motor-truck haul from there to the mine.

Save for Your Country or Slave for the Hun.

New Appliances

Direct-Current Elevator Control Panel—Western Electric Farm-Lighting Sets—Duncan Induction Watt-hour Meters

CAR-SWITCH ELEVATOR CONTROL.

Single-speed passenger and freight-elevator service requiring car-speeds up to 150 ft. per minute can be successfully handled by the Westinghouse type E elevator control used with compound-wound direct-current elevator motors.

The control is quiet in operation and the car on which it is used is always under complete direction of operator. Some of the features of the type E control panel are: (1) mechanically interlocked directional contactors, (2) line contactor, (3) accelerating contactor, (4) contacts interchangeable, (5) accelerating contactor is electrically interlocked with directional contactors, which prevents damage to motor from reversing without starting resistance in circuit, (6) flexible shunt relieves all bearings from carrying current, (7) dependable time-element dashpot, therefore ratio between resistance steps cannot be tampered with, (8) adjustment for time of acceleration easily made, (9) resistor mounted on panel, (10) all apparatus mounted on pipe framework.

The acceleration is smooth and uniform, being

Westinghouse Elevator Control Panel, Type E, for Direct Current.

effected automatically and thus entirely independent of the operator; it is therefore impossible to injure the electrical apparatus by careless or ignorant manipulation of a car switch.

The control is designed with time-limit acceleration with capacity for handling 10-hp., 115-volt, or 20-hp., 230-550-volt direct-current motors.

The apparatus is very simple, consisting of a control panel, a car switch and such elevator safety devices as may be desired.

A black-marine-finished slate panel is furnished with a pipe frame for floor mounting, and carries a main-line contactor, two directional contactors, which are mechanically interlocked, and an accelerating contactor, controlled by a large air dashpot for cutting out the starting resistance and series field. The resistors are mounted on the rear of the panel, making the control apparatus a complete unit, which can be mounted in any convenient place near the elevator motor, and rendering all parts easily accessible for inspection at any time.

Provision is made on the directional and line contactors for a shunt-brake circuit, which, when the control circuit is completed, energizes the brake magnet and releases the brake.

The contacts are graphite to graphite of the butt type (no sliding contacts used) and are easily renewed. All contacts, with the exception of those for the interlock, are interchangeable for alternating-current and direct-current type E controllers, for both car-switch and push-button operation.

A one-point car switch mounted in the elevator car furnishes the means by which the operator controls the movement of the car.

Safety devices may be connected in the control circuit so that the opening of any switch will bring the car to rest. Those most commonly used are the emergency switches, to be used by the operator in case of accident or failure of the car switch; machine-limit and hatchway-limit switches, which operate automatically to prevent accidents from over-travel, should the operator for any reason fail to release the car switch; and door switches, which prevent the starting of the car until the door is properly closed.

NEW DESIGNS IN FARM LIGHTING EQUIPMENT.

The demand for modern equipment for farms, caused by labor scarcity and a desire for better living conditions among the farmers, has brought out a number of improvements in all apparatus manufactured for this purpose, especially power and lighting equipments. The Western Electric Co. has recently put on the market a new power plant, to be known as its No. 15 direct-connected set which is worthy of special consideration.

This set, which is shown in the accompanying illustration, is a model in neatness, compactness, and efficiency. The entire outfit, including engine, generator, switchboard and a 16-cell battery, stands about 4½ ft. high and occupies about 30 to 40 sq. ft. of floor space. It is primarily designed for light and power purposes on farms where the buildings are not too widely scattered as the set delivers electricity at 32 volts and will therefore not permit of a very wide area of distribution. It is manufactured in two sizes, one having battery capacity of 2700 watt-hours on an 8-hour discharge rate and the other having a capacity of 5400 watt-hours. The generator has a capacity of 1500 watts.

The engine, which is 3¼ h.p., uses kerosene as fuel. The kerosene supply tank is located in the base of the outfit and a vacuum feed system is used to pump it to the engine. This method of fuel feeding has proven very successful in automobile fuel feeding and is perfectly suited to this outfit. It is self-starting, the gas engine being turned over by power furnished by changing the generator so that it operates as a

motor. This is accomplished by simply throwing in a switch on the switchboard. The speed of the engine is controlled by a throttle governor which controls the fuel supply automatically. This regulates the speed so closely that not more than a 2 per cent variation occurs whether the engine runs at no load or at full load. The oiling is accomplished by the splash oil system which has proven so successful in automobile oiling. The engine and generator are both air-cooled, so arranged that each unit gets its air directly from the outside. The whole outfit is so arranged that all parts are easily accessible for repairs and cleaning.

In addition to being an electrically started engine this direct-connected set has an automatic stop, which

New and Compact Direct-Connected Farm Lighting and Power Plant.

operates when the battery is fully charged. This is accomplished by opening the ignition circuit of the engine. The vacuum system of fuel feed is of added advantage here for the fuel supply is automatically turned off when the engine stops.

The control panel of the outfit is permanently attached to the base and on it is mounted the starting switch and the automatic stop. In addition it is equipped with an ammeter, a switch for cutting off the generator when the auxiliary pulley is used and two fuses, one large fuse for protecting the battery from a too heavy discharge when starting the engine and a small fuse for protection against overloads and short-circuits.

The outfit is given considerable extra value by the addition of what is called the auxiliary pulley. This is a 4-in. pulley mounted on the main shaft. By opening the switch the generator is cut completely off and the engine operates as an independent power unit, to which can be belted line shafting, hoists, saw mills, etc.

Special attention has been paid to the battery part of this outfit. The batteries are of the lead type and of special design and include several exclusive features. The grids are of solid framework and the crossbars are placed diagonally instead of horizontally which is the usual custom. The plates are extra thick to insure a long life.

As is well known, every precaution must be taken in charging a battery not to feed the current into it too fast, as this will injure the battery. The ideal method of battery charging, therefore, is one that gradually tapers off as the charge is made. This is known as a tapering charge and the generator in this outfit is so designed as to give such an effect. Moreover, the outfit is so arranged that by simply throwing in a switch the battery can be given an occasional soaking charge which offers a dual control of battery charging.

In addition to this direct-connected outfit, this company also puts out a belt-driven outfit including a generator, batteries and an automatic regulator panel. The advantage of such an outfit lies in the fact that it can be used with any type of engine. As a great many farms are already equipped with an engine the customer is saved the expense of purchasing a new one by buying this set.

A 110-volt set containing a battery of 56 cells is also built for use on large farms, plantations, and country homes where the distribution area and load are too large for the 32-volt outfits. This set, known as the *C F* and *C F E* outfits are built to comply with the same standards as the smaller sets.

NEW DUNCAN INDUCTION METER.

To meet the exacting requirements of present-day central-station practice in the measurement of electrical energy, the Duncan Electric Manufacturing Co., Lafayette, Ind., is offering its new model M2, alternating-current watt-hour meter as embodying the necessary qualifications, which are low maintenance cost, long life and extreme accuracy under varying conditions of power-factor, frequency and temperature. From a series of tests that have been conducted during the past half year, it has been demonstrated that the Duncan model M2 meter is a most desirable instrument, and is capable of meeting the most stringent demands.

Of supreme importance is the ratio of torque to weight, which in the model M2 is 4.2 to 1, the highest ratio known in meter design. Other interesting facts concerning the operation of this meter are as follows:

(a) Loss in series-field coils at full load is 3/10 of one watt.

(b) Loss in potential-field coils is one watt.

(c) Torque or turning moment is 42 millimeter-grams at full load.

(d) Light-load and full-load adjustments are ideally simple and instantly accessible.

(e) Field-coil replacements cost but one-third those of other makes.

(f) The terminals are molded in a fire and moistureproof compound.

The moving element is extremely light, being made

Bar Barbarism by Buying Bonds.

with a thin aluminum disk which is stippled in order to secure the strength and rigidity necessary to resist the bending effects of heavy short-circuits. The shaft is made of a special aluminum alloy possessing unusual strength and lightness. The whole moving element is so designed as to give it a very low center of gravity which releases all strain from the upper guide bearing. The lower bearing is composed of a sapphire jewel which affords a most durable wearing surface.

The only tool necessary for the complete taking apart and reassembling of this meter is a screwdriver. Moreover, the screws and parts are so arranged that it is not necessary in the majority of cases to remove them as any adjusting work can be accomplished by merely loosening the screws without removing and possibly losing them. Special pains have been taken to facilitate adjustments. Another feature, designed to simplify the work of the meter tester, is the test clip. This is a device by which the voltage coils of meters grouped together can be connected in parallel for testing. Moreover, the design of the element is such as to permit considerable handling while out of its case without damage.

The standard meters are provided with a cover of nonmagnetic metal enameled in hard-rubber black, although a glass cover will be supplied without additional charge, if required. The recording mechanism is made especially strong and rigid and is so designed that the reducing gears are given the same support

Figs 1 and 2.—The New Model M2 Duncan Induction Watt-Hour Meter With and Without the Cover. This Particular Meter Is of 5 Ampere Capacity and was Manufactured for the Western Electric Co. for South American Export and Is Equipped With a Cyclometer Dial.

Figs. 3 and 4.—Larger Size Model M2 Duncan Induction Watt-Hour Meter With and Without Cover. This 100-Ampere Meter Is Equipped With the Standard Dial.

and protection against misalinement that is given the gears of the dial train. The dial faces are of the usual design, approved by the Meter Committee of the National Electric Light Association, although the so-called Canadian and cyclometer registers are also supplied.

The model M2P polyphase meter embodies nearly all the features of the M2 single-phase meter. It is, in fact, merely a combination of two single-phase meters, mounted within a common base upon a common grid and having a common shaft and register.

The advantages of a meter containing all these features, coupled with a good design and backed by the reputation for skillful and careful manufacture which has been accorded the Duncan company, is obvious and should receive the earnest consideration of any central-station company.

Buy Liberty Bonds and KEEP Them.

Trade Activities

Western Electric's War Activities—Elliott Electric Engages Larger Quarters—Northwest Motor Erects New Foundry

Fairbanks, Morse & Company recently sold two 150-hp., 440-volt motors to the San Juan Fish & Packing Company, Seattle, for operating ammonia compressors. These are rated at 600 revolutions per minute.

Essex Storage Battery & Supply Company, 272 Halsey street, Newark, N. J., has announced the establishment of a new branch service station at 235 Central avenue, to be devoted exclusively to the maintenance of storage batteries of all kinds. The company has installed a charging plant which is equipped with autographic control, to prevent the overcharge of the storage battery. Alexander Lion will be in charge of the new station.

The Edison Storage Battery Supply Company, through its Seattle office, has placed a 110-volt battery plant for auxiliary lighting and wireless equipment on seventeen freight boats, the propelling power for which is supplied by oil and gasoline engines. Foster C. Gibson, resident manager, states that this type of storage battery has been adopted for underground mine haulage in both coal and metal mines in the West to a considerable extent. There is an element of safety about them that commends them to operators.

Northwest Motor Co., Seattle, is erecting and equipping a new foundry on East Waterway, Seattle. The installations consist of one 10-ton and two 5-ton electric cranes, and a 50-kw. motor-generator set to produce direct-current energy for the crane motors; also, a 100-hp. motor for operating an air compressor, and 200 hp. in small motors to drive blowers for cupola draft and various machines. Thompson & Castleton have the contract for making the installations, and are building the motor-generator set in their shop.

The Western Electric Company's distribution and storage warehouses, located in 35 of the principal cities of the country, are engaged almost exclusively in war work. To quickly and properly meet the demands of the numerous Government projects scattered over the entire country is a considerable undertaking when one considers the congested condition and shortage of railroad facilities. The Government officials, however, were quick to recognize the advantages presented by the warehouses and competent organizations of such companies as the Western Electric Co. Immediately following the outbreak of the war this branch of the company became engaged in Government work and at this time is expending every effort in this direction, as well as meeting the demands of the great industries which are engaged in war work. The October number of *Western Electric News* contains an interesting article describing this phase of the company's activities.

Ivanhoe-Regent Works of General Electric Co., Cleveland, Ohio, has issued catalog No. 276, dealing with Ivanhoe metal reflectors and fittings for industrial illumination. This is a splendidly printed and illustrated catalog of 53 pages which has a number of interesting features. It announces the new system of merchandising recently put into effect by the Ivanhoe-Regent Works. A number of pages are devoted to the subject of "How to Plan a Lighting System," this applying especially to industrial lighting. Nearly twenty pages are devoted to illustrated descriptions and listing of Ivanhoe reflectors, among which of special note are the Reflecto-Cap Diffuser and the new R-L-M standard dome reflectors, the latter being the first regular listing of this new and interesting development. The standard bowl and angle reflectors as well as the numerous other types of reflecting and enclosing equipment are also listed in a way to facilitate convenience of reference. Nearly half of the book is devoted to the Anderson self-adjusting arms, which are being marketed by the Ivanhoe-Regent Works. These include a very large variety of types and sizes of telescoping and otherwise adjustable arms for special bench, table, machine, garage or other cases of localized lighting.

The T. & S. Electric System has filed a notice of authorization to operate at 79 Orange street, Newark, N. J., for the production of electrical goods. John J. Steinharter, 157 Roseville avenue, heads the company.

Pass & Seymour, Inc., Solvay, N. Y., has just issued a new trade discount sheet, applying to P & S catalog No. 24 and cancelling all other quotations. The new discounts effect items appearing on Schedules A, B and L, C, D, XA and L, including sockets, receptacles, sign receptacles, rosettes, Uno shade holders, etc.

DeLaval Steam Turbine Co., Trenton, N. J., has completed negotiations for the leasing of the large plant of the Howard Demountable Rim Co., 1851 East State street, fronting on the Pennsylvania Railroad, to provide for increased operations. It is planned to remove the entire pattern shop of the company to the new plant.

Indianapolis Switch & Frog Company, Springfield, Ohio, recently published a 48-page booklet, entitled, "Electric Welding for Track and Shop Repairs," and is an excellent treatise on the subject of electric welding. It contains an article by E. C. Price, vice-president and secretary of the company, dealing in a very complete manner with the process of welding, and takes up the methods, characteristics, advantages, etc. Another article by the same author describes the use of electric welding in track joining and bonding as applied to electric railways. The booklet contains much valuable information on this subject, and tells of the care of the welder, drawing the arc, filling cups or low joints, etc. Complete instructions for applying "Indianapolis" welded joint and bonding plates are also given.

Elliott Electric Co. announces its removal from 322-328 Champlain avenue to 813-815 Superior avenue, N. W., Cleveland, Ohio, where it occupies the entire five floors and basement. The first floor is occupied by the retail store and supply department office; the second floor is devoted to the general office and machinery department office. The repair shop for the repairing of motors is located on the fourth floor and the remaining floors and basement are utilized to accommodate the large stock of motors and electrical supplies. The retail store is being remodeled and when completed will be the largest in Cleveland. The new location is very desirable, due to its central location which is just west of the Public Square. Plans are being put into effect to care for the increased business which made the removal to larger quarters necessary. The company does an electrical jobbing business, motor sales, repairs and rentals. General Electric motors up to and including 200-hp. are carried in stock by this concern.

Union Switch & Signal Company, of Swissvale, Pa., was recently awarded a contract by the Washington, Baltimore & Annapolis Electric Railroad, of Baltimore, Md., for block signaling to be installed over its double track line between Naval Academy Junction and District Line, near Washington. This is the second section of signaling recently undertaken on the main line of this road between Washington and Baltimore, the first between Naval Academy and Baltimore having already been placed in service. This new signaling will protect 36 miles of track and 37 switches with 20 blocks on a headway of approximately three minutes under caution and six minutes under clear signals. The signaling has been laid out to reduce this running time one-half by the later addition of intermediate signals when future traffic warrants. The apparatus will be similar to that employed in the first installation involving continuous a. c. track circuits, style "N" color type light signals mounted on iron pipe posts and model 15 vane relays. Switch indicators, light type with push button attachment will be used at all switches. Power at 2200 volts, 25 cycles, will be secured from the railroad company's power system located at Naval Academy Junction.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

BOSTON, MASS.—Boston & Maine Railroad Co. has recently awarded a contract to the H. Wales Lines Co., Meriden, Conn., for the construction of a new one-story engine house, boiler plant and administration building, about 30x65 feet, to be located at Rotterdam Junction, N. Y. The entire work is estimated to cost $75,000.

BOSTON, MASS.—The Trustees of the Public Library have awarded a contract to Ingalls & Kendricken, 47 Bowker street, Boston, for the installation of a new heating plant in the public library at 100 Brooks street in the Brighton district of Boston.

SPRINGFIELD, MASS. — Hendee Manufacturing Co., 837 State street, has awarded a contract for the construction of a one-story boiler plant and hardening shop at its plant. E. J. Pinney, 264 Main street, is the contractor.

BALDWINS, L. I., N. Y.—The United States Government has awarded a contract to the Austin Co., 217 Broadway, New York, for the construction of a boiler plant at the local Government station in connection with other buildings.

BINGHAMTON, N. Y.—The three-year contract between the Binghamton Light, Heat & Power Co. and the city of Binghamton whereby a low price was obtained for city lighting, expires on Dec. 31, and the board of contract directed the secretary to advertise for bids for lighting the city, beginning Jan. 1, 1919.

BROOKLYN, N. Y.—Considerable electrical equipment will be required in connection with new six-story reinforced-concrete factory being erected by H. W. Cotton, Inc., Thirty-fourth street, to be located at Thirty-eighth street and Thirteenth avenue.

BROOKLYN, N. Y.—The United States Government, Bureau of Yards and Docks, Washington, D. C., has authorized the construction of a large new hospital at the local navy yards, estimated to cost in excess of $1,000,000. Considerable electrical equipment will be installed in the structures, which will comprise two buildings of reinforced-concrete, three stories in height, one to have three wings and the other five, and will be located in the Wallabout Canal section of the navy yard.

BUFFALO, N. Y.—Pullman Co., 1770 Broadway, has had plans prepared for alterations and improvements in its engine plant. The work is estimated to cost $8,000.

FULTON, N. Y.—Fulton Light, Heat & Power Co. has petitioned for authority to issue $361,666 in bonds for proposed improvements. The company at its steam power plant on the lower dam proposes to install a new turbo-generator with a capacity of 2500 kw.a., two new 500-hp. boilers, extension to the powerhouse building, excavations in the pond for boiler water and condensing new foundations and other improvements and needed equipment, estimated at $209,850. Improvements at the water power plant are of the estimated cost of $151,816.

HUDSON, N. Y.—The board of managers of the New York State Training School for Girls has had plans prepared for the installation of electric lighting systems in cottages 5, 7, and 10 at the institution. Lewis F. Pilcher, Capitol building, Albany, is state architect.

ILION, N. Y.—Contract has been awarded by the Remington Arms Co. for the construction of the proposed one-story boiler plant at its local works, about 38x66 feet. R. Richards & Son, Elizabeth street, Utica, are the contractors.

LA SALLE, N. Y.—Suburban Power Co. has filed notice with the Public Service Commission of a change in its corporate name to the La Salle Electric Corporation.

LOCKPORT, N. Y.—The city council is planning for the early installation of new pumping equipment of 3,000,000 gallons capacity at the municipal waterworks at North Tonawanda, to provide for increased operations. It is understood that the apparatus will be electrically operated.

NEW YORK, N. Y.—Automatic Electric Co., Ltd., 21 East Fortieth street, has filed notice of the dissolution of the company.

NEW YORK, N. Y.—Ruvio Electric Co., 50 Broad street, manufacturer of electric specialties, has filed notice of the dissolution of the company.

GLOUCESTER CITY, N. J.—The common council has passed an ordinance authorizing the Public Service Electric Co. to install a new electric underground conduit system in sections of Essex street. Allan W. Redfield, city clerk.

GLOUCESTER CITY, N. J.—The common council has passed an ordinance granting permission to the Emergency Fleet Railway Company of New Jersey to construct, operate and maintain a double-track electric traction system in the city, to provide transportation facilities for workers engaged in the various shipbuilding plants in this vicinity.

NEWARK, N. J.—Howe, Bauman Rubber Co., 187 Murray street, has taken out a building permit for the construction of a one-story concrete and brick boiler plant to be located at 183 Murray street.

NEWARK, N. J.—Following the request of representatives of the Emergency Fleet Corporation, the food and fuel administrations, army and navy officials, and the Labor Department, the Public Service Corporation has announced that a survey of power requirements of manufacturers in the northern New Jersey industrial district will be made for the use of governmental agencies in establishing priorities. It is proposed to list all industries requiring 100 hp. or more, which lists will be submitted to the representatives of the various boards for guidance in assigning priorities should a power shortage occur.

PERTH AMBOY, N. J.—In connection with the extensive improvements in the local water supply system, the board of aldermen is considering plans for extensions to provide an adequate water supply to Camp Raritan. It is planned to install electric equipment for pumping operations, construct pipe lines, etc., at a cost of approximately $60,000.

TRENTON, N. J.—Following the recent order of the Board of Public Utility Commissioners for improvements to better its service, the Trenton & Mercer County Traction Co. is having plans prepared for betterments, etc., including new rolling stock. Additional generating equipment will also be installed in the company's power plant.

ALLENTOWN, PA.—To date, employes at the power plant of the Lehigh Valley Transit Co. on Front street have surpassed their subscriptions to the Third Liberty Loan by approximately twenty per cent for the present loan. A large new flag was recently unfurled at the plant.

CLIFTON HEIGHTS, PA.—The Kent Manufacturing Co. is having plans prepared for the construction of a one-story brick and concrete engine plant at its works, about 60x80 feet. Frank E. Hahn, 1112 Chestnut street, Philadelphia, is architect.

FORT MIFFLIN, Pa.—In connection with the construction of the four large new storehouses for the Government, Bureau of Yards and Docks, considerable electrical equipment will be installed, including lighting systems, motors, etc.

HAZLETON, PA.—Harwood Electric Co. and the Lehigh Navigation Electric Co., operating near Hazleton and at Hauto, respectively, are said to be considering extensive additions and improvements to increase their power facilities for the furnishing of electric energy to nearby towns and as far as Philadelphia. A bill has been passed by the House of Representatives authorizing the companies to make power-line extensions as a means to aid in the conservation of fuel.

LIVERPOOL, PA.—The borough council has recently completed the installation of an electric street-lighting system and inaugurated operations.

PHILADELPHIA, PA. — C. H. Wheeler Manufacturing Co., Eighteenth street and Lehigh avenue, has awarded

a contract to the M. W. Kellogg Co., 90 West street, New York, for the construction of a 135-foot stack, 11 feet in diameter, at its plant, to be used for power purposes.

PHILADELPHIA, PA.—Considerable new electrical equipment will be installed in the new emergency hospital buildings to be erected by the Government, Bureau of Yards and Docks, contract for which has recently been awarded at a price of $652,000.

PHILADELPHIA, PA.—It is reported that the Philadelphia Electric Company is negotiating with the Emergency Fleet Corporation for a loan approximating $6,500,000, to provide for the financing of new power requirements in this district. The company is making rapid progress on the construction of its new plant at Beach and Palmer streets, and work is progressing steadily on the additions to its plant at Chester. It is understood that the Chester plant of the company now has in operation a unit of 60,000-kw. capacity, and plans are under consideration for the installation of a similar unit.

SUNBURY, PA.—At the November election the question of issuing $225,000 in bonds to purchase the Northumberland County Gas & Electric Co.'s plant will be submitted to vote.

BALTIMORE, MD.—United Railways & Electric Co., Continental building, has let contract to Singer-Pentz Co., Equitable building, Baltimore, to erect a service station at Columbia avenue and Baltimore & Ohio R. R. tracks.

BALTIMORE, MD.—Consolidated Gas & Electric Lighting Co. has inaugurated a class for the training of women in the reading of meters and the installation of heating and lighting appliances, to take the places of men called for military service.

WASHINGTON, D. C.—In connection with the construction of a new tetryl plant by the War Department at Senater, Mich., to cost approximately $250,000, power plants and boiler houses for operation will be erected.

PORTSMOUTH, VA.—Announcement has been made that the War Industries Board has authorized the expenditure of a sum approximating $1,000,000 to provide for increased power facilities in this district, including high-tension power connections between Richmond, Petersburg, Suffolk, Portsmouth and Norfolk. It is understood that additions will also be made to the power plants in the various cities.

BAKERS, N. C.—The Government will build radio and wireless station in Union county, probably at Bakers, four miles from Monroe. Estimated cost $2,700,000. Address Capt. David W. Todd, Director of Naval Communication, Washington, D. C.

GASTONIA, N. C.—Piedmont Telephone Co. has increased its capital from $400,000 to $600,000. Improvements and extensions will be made. Address general manager.

MT. AIRY, N. C.—Plans are under consideration by the city commissioners for the construction of an electric power plant, to cost about $50,000.

PENSACOLA, FLA.—In connection with extensive improvements and additions at the plant of the Bruce Dry Dock Co., plans have been prepared for the installation of a new electrical pumping system to replace the steam-operated system heretofore in use.

DATES AHEAD.

Kansas Public Service Association. Annual meeting, Kansas City, Kans., October 17-19. Secretary-treasurer, W. W. Austin, Cottonwood Falls, Kans.

Jovian Order. Annual convention, Dallas, Texas, October 24-25-26. Mercury, Ell C. Bennett, 1415 Syndicate Trust building, St. Louis, Mo.

Western Association of Electrical Inspectors. Annual meeting, Chicago, Ill., January 28-30, 1919. Secretary, W. S. Boyd, 175 West Jackson boulevard, Chicago, Ill.

NORTH CENTRAL STATES.

CLEVELAND, OHIO.—Ohio State Telephone Co. Electric building, has had plans prepared by Architect Willard Hirsch, 1302 Swetland building, for a $12,000 telephone exchange building.

GALESBURG, ILL.—Galesburg Railway, Lighting & Power Co. has filed a petition with the Illinois Public Utilities Commission asking for permission to operate one-man cars on certain lines in that city.

HAVANA, ILL.—The installation of a municipal electric light plant in Havana is under advisement.

KEMPTON, ILL.—Bonds have been voted to purchase electric light plant. Address town clerk.

MOLINE, ILL.—The Illinois Public Utilities Commission has denied the petition of the Tri-City Railway to make an extension of track. The commission found the extension justified but held that the shortage of labor and materials is such that it cannot be done at present.

SPRINGFIELD, ILL.—Plans are under way for important additions and extensions to the Springfield street railway system after the war. Address A. D. Mackie, general manager of the Consolidated Railway Co.

BARRON, WIS.—Plans have been completed for proposed dam, electric equipment. Plans have been prepared by Engineer J. C. Jacobson, First National-Soo Line building, Minneapolis.

OCONTO, WIS.—Plans have been completed for improvements to power plant of Oconto Service Co., including water turbine, generator, switchboard. Mead P. Seastone, State street, Madison, engineer.

REEDSBURG, WIS.—A franchise has been granted to Wisconsin Power, Light & Heating Co., 1518 Edison building, Chicago, Ill., and Wisconsin Valley Utilities Co. for light and power.

TRURO, IOWA.—Truro Light & Power Co. is in market for 15-kw. and 25-kw., 3-phase, 60-cycle, 2300-volt generators. Address secretary.

ELLIS, KANS.—Engineers Black & Veatch, Kansas City, have prepared plans for improving the Ellis electric light plant. Address town clerk.

MADISON, S. DAK.—The city commissioners have decided to submit to the voters the question of issuing $150,000 in bonds to rebuild the electric light plant recently destroyed by fire. Address city clerk.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—The commercial department of the Louisville Gas & Electric Co. during the week ended Sept. 28 accepted 67 new electric light and power customers with 36 kw. of light in motors. New business connected to the company's lines includes 38 customers. Electric energy output for the week shows an increase of 23 per cent over the corresponding period last year.

LOUISVILLE, KY.—Louisville Gas & Electric Co. is said to be considering plans for extensions in its transmission system to Stithton, for the purpose of furnishing electric energy to the Government station at that point.

SMITHS GROVE, KY.—Smiths Grove Light & Ice Company has recently filed notice of an increase in its capital from $5,000 to $10,000, to provide for expansion.

STITHTON, KY.—Louisville Gas & Electric Co. will extend its electric transmission system to Stithton to supply electricity at the artillery camp.

GADSDEN, ALA.—Plans have been prepared for equipping the pumping station of the waterworks system for electrical operation. Three large pumps with motors and auxiliary equipment will be installed.

ARDMORE, OKLA.—East Ardmore Coal Co. contemplates the purchase of mining equipment, including a power plant. Address J. W. Weeks.

EL RENO, OKLA.—New business of the Oklahoma Gas & Electric Co. at El Reno includes 60 hp. in motors now being connected for the Guthrie Cotton Oil Co.'s cotton gin.

GONZALES, TEX.—Ed. Kennedy (purchasing agent of Houston, Richmond & San Antonio Interurban Ry.) is promoting the organization of a company to operate a water power plant; leased hydroelectric development on Guadalupe river at Oak Forest, nine miles from Gonzales. The height of the dam will be increased from 8 to 15 feet and generate electricty for interurban railway.

McALLEN, TEX.—Louisiana-Rio Grande Canal Co. is considering plans for the installation of new pumping equipment at the second-lift irrigation pumping plant to cost approximately $200,000.

WESTERN STATES.

GREAT FALLS, MONT.—Montana Power Co. has in progress the construction of 50,000-volt transmission line, 32 miles in length from Great Falls to Conrad and Chateau. The line is to be completed in November.

GREAT FALLS, MONT.—Anaconda Copper Co. is having an electric railway built from its works at Great Falls to its new copper-wire mill. A contract for the construction of the line has been let to Fitzgerald & Staunton. Montana Power Co. is to furnish the electric power for the railroad and for the wire plant. Wire for the trolley line is to be made at the new wire plant.

HELENA, MONT.—Economy Mines Co., operating mining properties near East Helena, has recently completed the installation of a quantity of new electrical equipment for operation. The

company has in course of construction a new concentrating mill, which will be electrically-operated.

LIBBY, MONT.—In connection with extensive improvements and additions at the plant of the Lukens-Hazel Mining Co., to cost approximately $150,000, plans have been prepared for the construction of a hydroelectric power plant for operation.

BREMERTON, WASH.—The city council has passed an ordinance approving the construction or purchase of an electric light and power plant, to be used for municipal purposes, at a cost of approximately $200,000.

CHEHALIS, WASH.—Considerable electrical equipment is being installed by the Superior Coal Co. at its mine in Chehalis. Electricity will be furnished by the North Coast Power Co. D. W. Proebstel, electrical engineer, Portland, Ore., is in charge of the installation.

KALISPELL, WASH.—The Northern States Power Co. has recently completed the construction of a new telephone line between Kalispell and Whitefish.

PASCO, WASH.—Pacific Power & Light Co. has proposed to the city to put in incandescent street lights in place of the arc lights now in use.

SEATTLE, WASH.—The plant of the Rothert Process Steel Co., which has been producing 1000 pounds of high-grade tool steel per day, is to be doubled in capacity. The equipment consists of an electric furnace, reheating furnace, steam hammer and one-handling equipment. Magnetite ore for this work is received from Washington and British Columbia mines.

SEATTLE, WASH.—Rogers-Brown Importing Co., whose plant is on East Waterway, has had plans made for a reinforced concrete power house, 42 by 42 feet, to house equipment for electric pumping required in handling imported vegetable oils.

SEATTLE, WASH.—Aurora Foundry, recently destroyed by fire, is to be reconstructed after plans drawn by F. W. Grant, architect, Mehlhorn building. The new plant will be 120 by 70 feet and will be equipped with electric furnaces, a traveling crane and other electrically-driven equipment. Bids were asked on equipment early in October.

SEATTLE, WASH. — Skinner & Eddy Shipbuilding Corporation has a permit to erect a power house at 1201 Railroad avenue, south.

TACOMA, WASH.—Commissioner Gronen of the light and water department has been authorized to purchase a 1000-kw. generator set at a cost of $13,500.

USK, WASH.—Plans have been completed by the Mountain State Power Co. for the construction of a new transmission line from Usk to Chewelah, a distance of approximately twenty miles. The work is estimated to cost in the neighborhood of $90,000.

CRESCENT, ORE.—Dr. N. E. Winnard, Heppner, has undertaken the development of electric power at Crescent, to pump water for irrigating land in the Fort Rock district.

PORTLAND, ORE.—Pacific Power & Light Co. has purchased a number of water power sites on Hood river for possible development after the war closes. A survey has been made for pipe line from a dam site near Wynans to Ruthton, and a right-of-way for such line has been secured.

CHICO, CAL.—Local authorities have announced that arrangements have been completed for active work on the building of the proposed 4000-acre irrigation system on the Phelan ranch, including the erection of electrically-operated pumping plants at the mouth of Chico creek. the entire work being estimated to cost $55,000.

FRESNO, CAL.—San Joaquin Light & Power Corp. has completed final arrangements for the issuance of bonds for $113,000, to be used, it is understood, for extensions and improvements in its plant and system.

INGOT, CAL.—Afterthought Copper Co. has under consideration the construction of an electrolytic plant at its mines.

KESWICK, CAL.—Considerable new electrical equipment will be required in connection with the construction of the new 30-ton capacity mill at the Scottish Chief mine, near Keswick. M. A. Maher is superintendent.

LOS ANGELES, CAL.—Los Angeles Terminal Co. has awarded a contract for the construction of a pumping station on South Central avenue, estimated to cost $4,500. Wurster Construction Co., 750 Central avenue, is the contractor.

SACRAMENTO, CAL.—Northern California Power Co., San Francisco, has under consideration the erection of an electric transmission line from Pitt river to Sacramento.

SAN DIEGO, CAL.—In connection with the construction of the proposed new laundry building by the War Department at Camp Kearny to cost in the neighborhood of $150,000, plans have been prepared for the erection of a new power plant for operation.

VALLEJO, CAL.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., has under consideration the installation of a turbogenerator at the Mare Island navy yard (Specification 3352).

VALLEJO, CAL.—Extensive improvements and extensions are contemplated by the Vallejo Light & Power Co., including the installation of transformers, etc., the erection of a second transmission line from South Vallejo to the Kentucky street plant.

PROPOSALS

ELECTRICAL EQUIPMENT.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will soon receive bids for furnishing the following equipment: Grinder and motor for delivery at Philadelphia, Pa. (Schedule 6036½); motor generator sets, delivery San Diego, Cal. (Schedule 6048½), and power driven saws, delivery Portsmouth, Va. (Schedule 6186½).

DISTRIBUTING SYSTEM.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 14 for a distributing system to cost about $275,000 (Specification 3385).

TURBINES, PUMP SET, ETC.—Bids for turbines, pump set, feed water heater and electric light plant will be received Oct. 24 by the Mississippi River Commission, first and second districts, Customer House, Memphis, Tenn. Further information on application.

CABLE AND WIRE, ELECTRICAL MATERIAL, ETC.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Oct. 16 for copper cable and wire, electrical material, ceiling fans, repair parts for cars, etc. Blanks and information relating to this circular (1231) may be obtained from the above office or the office of the assistant purchasing agent, 24 State street, New York City; 606 Common street, New Orleans, La., and Fort Mason, San Francisco, Cal.

INCORPORATIONS

PALM BEACH, FLA.—Palm Utilities Co. has been incorporated with the capital of $50,000. Address F. L. Ridington, secretary.

HILLSDALE, ILL.—Rock River Valley Light & Power Co. has incorporated with a capital of $20,000 by Clarence D. Butzer, Frank L. Wake and Fred Frels.

RENO, MINN. — New Albin & Crooked Creek Farmers' Telephone Co. has incorporated with a capital of $875. Address Wm. H. Wunnecke.

MONTVERDE, FLA.—Montverde Telephone Co. has been incorporated with the capital of $5,000. Address W. J. Larrimore, secretary.

PRESTONSBURG, KY.—Eastern Kentucky Service Co. has been incorporated with the capital of $5,000, by W. S. Wells and others. The company will install power plant.

NEW YORK, N. Y.—Straight Line Regulator Corporation. Capital, $50,000. To manufacture motors, etc. Incorporators: W. Asbury, J. Rawle and W. A. Daly, 261 Broadway.

BUENA VISTA, GA.—Buena Vista Telephone Company. Nominal capital, $5,000. To operate a local telephone system. F. L. Clements is the principal incorporator.

SPRINGFIELD, MO.—Articles of incorporation have been filed by the Republic Lighting & Power Company. The capital stock of the corporation is listed as $5000. The stockholders in the new concern are G. W. Thurman, Manerva Chaffin and H. L. Pemoyer.

NEW YORK, N. Y.—Derf Manufacturing Company. Capital, $100,000. To manufacture engines, motors, and kindred products. Incorporators: W. B. Noble, F. L. Hartt, and W. F. Wilson, 28 West One Hundred and Thirtieth street.

CHARLOTTESVILLE, VA.—Briggs Electrical Company has incorporated with a capital of $50,000 to engage in the electrical contracting business. The incorporators are Samuel Briggs and D. C. Slobah.

Recent Patents

Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Multicell Dry Battery (1,277,147).—Where battery cells are stacked above one another, Arthur V. St. Armande (of Paisley, Scotland) holds them in position by shrinking a wrapper on them.

Electric Hoist (1,277,218).—Samuel E. Kalbach (of Reading, Pa.) describes a novel stop device connected to a portable electric hoist.

Dry Battery (1,276,714).—In addition to the electrolyte in a dry cell having zinc and carbon electrodes, Raymon C. Bennett, of Fremont, Ohio, uses a paste adjacent to the zinc and containing an alkaline bichromate.

Lightning Arresters (1,276,783 and 1,277,095).—These patents, both assigned by John R. McFarlin, of Philadelphia, to the Electric Service Supplies Co., show two types of inclosed lightning arresters in which an air gap is placed in the path of a blast through a restricted outlet.

Electric Switch (1,276,675). — To prevent arcing, Ezra B. Merriam, of Schenectady, mounts his switch parts in a vessel of insulating fluid and circulates this fluid rapidly over the contacts while the latter are being moved to their circuit-opening position. Patent assigned to the General Electric Co.

Calibrating Fuses (1,277,045).—To vary the carrying capacity of fuse

No. 1,277,045.—Calibrated Fuse Element.

links, Robert C. Cole, of Hartford, Conn., provides the strips with triangular perforations. (Patent assigned to the Johns-Pratt Co.)

Electric Heating Pad (1,276,150).—To make a flexible heating pad, Charles Wirt (of Philadelphia) places a zigzagged high-resistance wire between two sheets of flexible asbestos, puts an outside sheet of flexible but nonfireproof material on each side, and then sews all the parts together by means of threads which hold the resistance wire in place.

Controlling Phase-Converters (Reissue Patent 14,510).—A phase-converter of the polyphase motor type is electrically connected between a single-phase source of current and a polyphase load circuit, and a number of current-responsive devices are connected to the branches of the load circuit and to a controller. This controller is arranged for automatically maintaining the polyphase currents substantially balanced under all conditions of load. The patent was assigned by E. F. W. Alexanderson, of Schenectady, to the General Electric Co.

Flatiron Switch (1,275,552).—As a safeguard against overheating an electric iron when not in use, John C. Griesel (of Pottsville, Pa.) provides it with a switch having a projection engaged by a lug on the stand, so that the current is automatically shut off when the iron is placed on the stand.

Electric Switch (1,277,223).—A motor-starting switch for use on automobiles, in which a channel is provided for ventilating the case and dissipating the heat from a strip resistance. Patent assigned to the firm of Robert Bosch by Franz Kratz and Gottlob Honold, both of Stuttgart, Germany.

Time-Operated Switch (1,277,082).—An alarm-clock attachment for causing the alarm key to move a switch handle. Patented by Swan G. Johnson, of Los Angeles, Cal.

Electric Fuse (1,276,800).—To support one end of an inclosed fuse, Elmer L. Ogle, of Chicago, collapses one end of a metal tube to make this grip the fuse, and threads the tube so as to make it fit a screw passing through the end of the inclosing casing. Patent assigned to the Federal Sign System (Electric).

Commutator Building (1,276,856 and 1,276,857).—Where two commutator bars form a pair in a single slot, radially of the commutator, Vincent G. Apple (of Dayton, Ohio) connects them by electrically welding the projecting ends to each other.

Controller Lock for Electric Tractor (1,277,188).—To prevent tampering of the controllers of an industrial electric tractor, George W. Bulley, of Chicago, in a patent assigned to the Mercury Mfg. Co., provides a lock on the controller shaft which is released only when the operator occupies the seat on the vehicle.

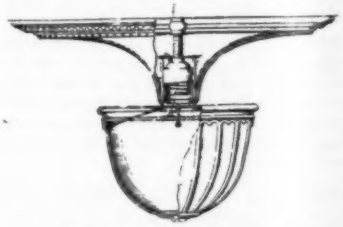
Speed-Controlled Headlights for Automobiles (1,277,104).—A duplex electric headlight is arranged to be operated by the same generator that supplies the ignition circuit. One of the lamps in the headlight is always connected to the generator, but the second lamp is connected only while the engine is running above a certain speed. The inventors of this scheme are Seth Mulvaney and E. L. Borner, of Inglewood, Cal.

Closet (1,276,784).—An electrical arrangement for heating the toilet bowl is described by Alexander McGary and John P. Sunderland in this patent, assigned to the Gould Coupler Co. of New York.

Telephone and Telegraph Cable (1,277,025).—This combination cable consists of four wires formed of two pairs twisted in reverse directions and about each other so as to form a quad, one of the pairs having twists longer than the quad twists. This patent of G. A. Anderegg and W. E. Mougey has been assigned to the Western Electric Co.

Control Systems (1,276,911 to 1,276,914).—A series of patents assigned by Rudolph E. Hellmund (one of a joint patent with Harry R. Meyer and Andrew H. Candee) to the Westinghouse Electric & Mfg. Co. They relate to methods of operating alternating current motors of the commutator type, including pulsating-torque motors.

Ceiling Fixture (1,276,966).—Both the light-reflecting canopy and the bowl are supported by a holder hav-



No. 1,276,966.—Semi-Indirect Fixture.

ing rods extending alongside the socket in the fixture patented by Harry Rubin, of Baltimore, Md.

Electric Hammer (1,276,804).—An electromagnetic hammer in which the current is successively shifted from one solenoid coil to another by rotating commutators. Patented by George M. Painter, of Chicago.

Line-Wire Fastening (1,276,228).—Instead of tying a line wire to an insulator with another wire, James C. Keenan and Michael H. Keenan (both of Toronto, Ont.) use a metal strap passing back of the insulator and formed at each end into a split sleeve encircling part of the line wire.

Voltage Regulation (1,276,827).—To regulate the voltage on a supply line, Harry L. Tanner (of Brooklyn, N. Y.) uses a regulating dynamo having a field winding in series with one side of the supply line, and connects the opposite side of the line with an intermediate point of the field winding. Then he causes changes in the voltage on the line to make and break this connection. (Patent assigned to the Sperry Gyroscope Co. of Brooklyn.)

Men in Service

Gerard Swope Appointed Assistant Director of Purchasing Branch—S. B. Burrows Takes Up Y. M. C. A. Work

HERBERT REUSCH, formerly of the Church street office of the Cutler-Hammer Manufacturing Co., is now with the Naval Reserve at Newport, R. I.

N. B. NELSON, F. H. ZIMMER, H. W. BAUMER and V. B. OLSON, of the testing department of the Commonwealth Edison Co., Chicago, have joined a unit of the Students' Army Training Corps, which opened Oct. 1 at the University of Illinois.

L. M. NICHOLLS, who has been employed as a statistician with the Western Electric Co., New York City, will go to Washington about the middle of the month to take up work in the statistical end of the general staff of the War Department. He will remain there for the duration of the war.

N. E. L. A. HONOR ROLL.—Member companies of the N. E. L. A. up to June 18 had contributed 14,135 officers and men to the Army and Navy. Their subscriptions to the three Liberty Loans amounted to $43,227,760; to the Red Cross $1,588,019, and to War Savings Stamps $667,546.

LIEUT. WILLIAM H. SPENCER, who prior to his enlistment was inspector of installation of the Southwestern Telephone Co. at St. Louis, was awarded a Distinguished Service Cross on Sept. 6 for gallant service in France. Lieutenant Spencer is with the 412th Telegraph Battalion and is now in charge of a rifle school in France.

F. J. SOUTHERLAND, agent at Richmond, Cal., for the Pacific Gas & Electric Co., is now undergoing a course of intensive training at Fort Omaha, Nebraska. This course covers several weeks of military training, ground school training for air service followed by the usual training given a flying cadet.

LIEUT. WALTER HENDRICKS, formerly connected with the Western Electric Co. at Hawthorne, Ill., is now in the Aviation Corps. He took his ground school work at Champaign, Ill., and received his flying instructions at Kelly Field No. 2, San Antonio, Tex. From there he was sent to Chanute Field, Rantoul, Ill., where he was commissioned as second lieutenant.

MAJOR A. H. GRISWOLD, formerly plant engineer with the Pacific Telephone & Telegraph Co., San Francisco, Cal., is among the engineers in France who have applied for authority to organize a section of the American Institute of Electrical Engineers among the American overseas forces. A large number of Institute members are now in France and there are about 300 engineers stationed in the immediate vicinity where it is proposed to establish the headquarters of the section. It is reported that excellent work is being done by Major Griswold in France in the organizing of telephonic communication, which is largely in his hands.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW *will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

W. J. KERR of the bond department of H. M. Byllesby & Co., Chicago, has enlisted in the school for field artillery at Camp Zachary Taylor, Louisville, Ky.

J. F. McGUIRE, manager of the Minot, N. Dak., division of Northern States Power Co., is captain of the local Liberty Loan Committee for the Fourth drive.

R. E. PALMER, formerly of the Central Station Institute of the Commonwealth Edison Co., Chicago, was recently commissioned a second lieutenant in the Coast Artillery, and expects to leave for France in the near future.

S. B. BURROWS, general lighting representative of the Public Service Electric Co., Newark, N. J., has taken up work with the Y. M. C. A. as an athletic director in France. Mr. Burrows joined the Public Service company in 1910 as electric sign specialist, and shortly afterward was promoted to general lighting representative. He was chairman of the store-lighting committee of the Commercial Section, National Electric Light Association, for the past four years.

GERARD SWOPE, vice-president and general sales manager of the Western Electric Co., and who for the past few months has devoted much of his time to assisting the War Department at Washington, has been appointed an assistant to the director of purchase, storage and traffic of that department. Mr. Swope, by reason of his wide experience and ability, is well qualified to render very great and real service and his connection with that division is of no little importance. The Purchase, Storage and Traffic Division of the General Staff is responsible for the purchase of supplies for all branches of the Army, for the storage of those supplies, transportation to the port, transshipment across the Atlantic, and is also responsible for the transportation and embarkation of troops.

HORACE N. TRUMBULL, advertising manager of the S K F Ball Bearing Co., Hartford, Conn., has entered the Reserve Officers' Training Camp at New Haven, Conn.

C. M. BREWER, manager of the Richmond (Cal.) division of Western States Gas & Electric Co., is a member of the local Executive Committee for the Fourth Liberty Loan drive.

WILLIAM BURGESS, Trenton, N. J., connected with the Association of Manufacturers of Electrical Supplies in an advisory capacity, has been named a member of the commodities sections of the War Industries Board.

A. C. EGART, chief clerk in the engineering department of the Southwestern Bell Telephone System at St. Louis, recently left the company to join the Red Cross. He has departed for San Antonio, Tex., where he will be assigned to work in camps near there.

W. A. WEICKELT, formerly of the Chicago office of the Cutler-Hammer Manufacturing Co., is now stationed at the U. S. Naval Air Station, Whiddy Island. Mr. Weickelt went to the Great Lakes Station in January in radio, but was later transferred to the seaman branch in order to see earlier service.

MARMION S. OLDACRE has been promoted to a second lieutenancy in the Quartermaster's Corps, being assigned as assistant to the officer in charge of the construction and repair branch. Previous to entering the National Army Mr. Oldacre was employed as testing engineer with the Commonwealth Edison Co.

HERMAN GAMPER, of Columbus, Ohio, who has been engaged in the physical valuation of the light and power properties of the Columbus (Ohio) Railway, Power & Light Co., has been appointed power engineer of the Emergency Fleet Corporation. He will be stationed at Philadelphia, but will return occasionally to continue his appraisal work on the Columbus properties.

Western Electric Co. employes to the number of 5223 are now enrolled in the armies and navies of the United States and its allies. Every department, every distributing house and allied houses in these countries, which are engaged in the great struggle for democracy, are represented on the company's roll of honor. Of this number 123 men are commissioned officers.

ARTHUR F. ALLSOP, industrial heating engineer, Commonwealth Edison Co., Chicago, has entered the Ordnance Department of the army. During his several years with the Commonwealth Edison Co., Mr. Allsop devoted the major portion of his time to the cultivation of the electric heating load, industrial primarily, but also domestic. He is responsible for the development of a large number of special heating appliances employing electrically made heat for industrial, military and naval uses.

Personal

G. V. W. Ingham Promoted — Robert C. Byler Appointed Advertising Manager S. K. F. Administrative — Changes

L. E. CALDWELL, who recently resigned as manager at LaCrosse, Wis., for the Wisconsin-Minnesota Light & Power Co., is now Cleveland (Ohio) representative of Halsey, Stuart Co., Chicago, a well known public utility financial concern. Mr. Caldwell was formerly manager at Iowa City (Iowa) for the United Light & Railways Co. and is well known among public utility men.

GEORGE V. W. INGHAM, who was recently appointed eastern sales manager of the Bryant Electric Co., was educated in the public schools of Syracuse, N. Y., and at Syracuse University. For several years he engaged in the typewriter business in Syracuse and in the fall of 1906 removed to Chicago as

G. V. W. Ingham.

western manager of Pass & Seymour of Syracuse, N. Y., joining the Bryant company in 1911. For 12 years, Mr. Ingham has traveled constantly through the western sections of the country, and enjoys a wide acquaintance among the electrical fraternity throughout the United States.

WARE PARSONS, formerly treasurer and manager of the Springfield (Ohio) Light & Power Co., has been appointed general manager of a group of properties, covering the territory between Pomeroy and Middleport at one end and Nelsonville at the other. Mr. Parson has established headquarters at Athens, Ohio.

WILLIAM O. DAHLSTROM, formerly connected with the Bryant Electric Co., Bridgeport, Conn., and for the past three years with the Inland Electric Company of Chicago, has returned to the Chicago office of the Bryant company and will act as field representative in the territory west and northwest of Chicago. This is the territory formerly covered by George V. W. Ingham, recently appointed eastern sales manager of the company.

E. J. DUNN, of Harvard, Wis., has disposed of his business, and will take charge of the East Montana Light & Power Co., with headquarters at Beach, N. Dak.

ARTHUR F. LOOMIS, formerly connected with the Glenn L. Martin Co., in the aircraft production department, has accepted a position in the Cleveland office of the Cutler-Hammer Manufacturing Co.

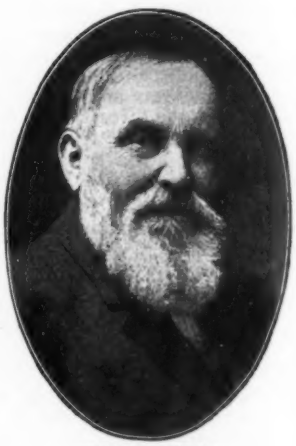
D. M. PETTY, president-elect of the Association of Iron and Steel Electrical Engineers, is superintendent of the electrical department of the Bethlehem Steel Co., South Bethlehem, Pa. Mr. Petty was born on March 2, 1885, at Archdale, N. C. He was graduated from Guilford College in 1907 with the degree of B. S. and in 1909 received the degree of Electrical Engineer from the Lehigh University. Since then Mr. Petty has been associated with the Bethlehem Steel Co. and in 1913 was appointed superintendent of the electrical department.

ROBERT C. BYLER, for nearly four years advertising production man for the S. K. F. Ball Bearing Co. of Hartford, Conn., has been appointed advertising manager of the S. K. F. Administrative Co. of New York City and will direct the advertising of the S. K. F. Ball Bearing Co., of Hartford, the Hess-Bright Manufacturing Co., of Philadelphia, and the Atlas Ball Co. of the same city, all of which are controlled by the S. K. F. Administrative Co. Until arrangements are made in New York City, Mr. Byler will remain with the S. K. F. Ball Bearing Co. of Hartford, Conn.

Obituary.

SAMUEL A. FRESHNEY, district manager for Grand Rapids, Mich., of the Consumers' Power Co., passed away at his home on Sept. 16 after an illness of only a few hours. Mr. Freshney, who had been closely identified with many branches of the electrical industry for over thirty-four years, was born in London, England, in 1867. He began his career in the electrical field in 1884 with the Brush Electric Co., Cleveland, Ohio, one of the pioneer electrical manufacturers. After seven years' connection with the Brush organization, Mr. Freshney came to Muskegon, Mich., becoming manager of the Muskegon Light & Power Co., whose plant he developed to a high state of efficiency. In 1900 he became associated with the Fort Wayne (Ind.) Electric Works, serving for two years as special sales engineer. Two years later he returned to Muskegon as general manager of the Muskegon Traction & Lighting Co., which position he held for three years. He was appointed secretary and general manager of the Grand Rapids Board of Public Works in 1905 and after seven years' service in the public interest became associated for four months in 1912 with the Electric Bond & Share Co. of New York City. In the fall of that year he was appointed general manager of the Grand Rapids-Muskegon Power Co., and on its merger with the Consumers' Power Co. was retained as manager of the Grand Rapids district, the position he held at the time of his death. Mr. Freshney took an active part in national association activities and in 1915 was elected president of the Michigan Section N. E. L. A.

MATHIAS KLEIN, the founder of the well known firm of Mathias Klein & Sons, manufacturers of telegraph, telephone and other linemen's tools, closed his career on Sept. 28, passing away at



Mathias Klein.

the ripe age of ninety-two. In his decease the industry loses a pioneer in the development of tools for the lineman and electrical mechanic. Mr. Klein came to Chicago in 1855, and in 1857 opened a blacksmith's shop. This was at a period when line construction was in its infancy and the highly efficient tools of today were undreamed of. With the increasing demand for tools of this kind, Mr. Klein saw the possibilities and accurately concentrated his efforts toward the production of tools for telegraph and telephone construction work. Thus, step by step, the development of the industry has been closely linked with this manufacturer, most of the notable improvements in tools of this character having been conceived and inaugurated by that organization. Almost to the end of his well rounded out span of life, Mr. Klein's faculties were undimmed, and he took an active part in the business until only three years ago, at which time the active control of the organization was assumed by his sons, John M., and Joseph A. Klein. Remarkable progress has been made by this concern and its rapid growth has necessitated the erection of more commodious quarters from time to time.

After the War, What ?

VI.

Two Problems

Two tremendous problems confront the American business man today.

The first is, of course, that the war must be won.

The second is preparedness for peace when it comes, with the least possible degree of commercial confusion and unrest attending the cessation of war.

Every product that is floundering in search of a market will be a disturbing element after the war. Advertised brands will serve as stabilizers—helping themselves as they could not be helped in any other way, and helping business in general.

The patriotic phase of this question demands that business be kept as near normal as possible —with full recognition of the government's needs in the great task of winning the war.

All government officials, including the President himself, realize the necessity for this. Taxes come from production. Treasury funds, Liberty loans and money for relief work of various kinds are dependent upon the country's prosperity, and the national welfare is measured by that of the individual. We must sacrifice and we must save, but we must protect business in order to do these things.

While the map of the world is being changed, new names will be stamped upon the map of American business. Manufacturers who have never advertised—who have never protected themselves by constructing the one impregnable wall of national good-will and prestige—should accept an opportunity which may not present itself again so favorably for many years. And manufacturers who have long been advertising will permit that wall to be weakened in no measure whatsoever.

To win, we must fight—and to fight we must have those sinews of war which can only be created by the industries of peace.

A. L. GALE.

THE following is from a brochure on "War Time Advertising for Future Benefit" copyright by Critchfield & Co., Brooks Bldg., Chicago. Get a copy and read it.

INTERNATIONAL TRADE PRESS, Inc.
C. A. Tupper, President . CHICAGO

Financial News

Government Compensation to Bell System.

Theodore N. Vail, president of the American Telephone & Telegraph Co., has made public the basis of compensation arrived at between Postmaster-General Burleson and the Bell system for Government control. He stated that the representatives of the company were met in a spirit of absolute fairness by the Government representatives and with an earnest desire to preserve the service to the public and preserve the property for the proprietors as well as to give them established returns on their securities.

Continuing, Mr. Vail says:

"The principles adopted as a basis of compensation were: First, any compensation fixed for the period of control was to be considered as compensation for an emergency period and not in any way considered as establishing a value for the property. Second, the operation of the property is to be continued on a basis of efficiency relatively equal to that of the past.

"Third, the property is to be fully maintained so as to be turned back to the company as good as when received. Fourth, appropriation from current revenue for depreciation and obsolescence to be the same as the past—an average of 5.72 per cent on the fixed capital—amortization of intangible capital to be relatively equal to the past. All unexpended balances from both to be invested in the plant of the system. Charges against the depreciation reserve to be in accordance with the rules of the Interstate Commerce Commission.

"Fifth, employes' pensions, disability benefits and death benefits now in operation to be continued. Sixth, all taxes, municipal, state or federal, to be paid or reimbursed if paid by the companies by the government.

"Seventh, the license and rentals contracts between the American Telephone & Telegraph Co. and the license companies to be continued, and the American Telephone & Telegraph Co. is to give such advice and assistance as the postmaster general may require, is to maintain its scientific, technical and engineering departments, its patent protection for the benefit of the property in the same manner as heretofore. The postmaster-general to have the benefit during the period of control, in the operation of the wire system, of all inventions, discoveries, and ideas which may now or hereafter be controlled by the Bell system."

Consolidation of New York Companies Approved.

Announcement has been made that the Public Service Commission has granted informal approval of the application of the Hydraulic Power Co. and the Niagara Falls Power Co. of Niagara Falls for permission to consolidate with a capitalization of $62,000,000, to provide increased power facilities for the operation of various plants in this vicinity engaged on Government contracts. It is understood that plans are under way for the construction of a large new power plant in the Niagara gorge, estimated to cost in excess of $10,000,000. At the present time a total of 255,000 hp. is being generated, and under the new arrangement it is held that a total of 411,000 hp. will be developed. It is also planned to install two large new units of approximately 33,000 hp. each, the entire plant to be ready for operation within twelve months.

Illinois Utility Authorized to Issue Stock.

The Southern Illinois Light & Power Co., which owns and operates electric light and power plants in a number of communities in Central and Southern Illinois, has been authorized by the Illinois Public Utilities Commission to issue first mortgage six per cent bonds to the amount of $697,970 and to issue six per cent cumulative stock to the amount of $292,188.

Earnings.

UNITED RAILWAYS INVESTMENT.

For the year ended June 30—Total income, $1,703,508, decrease $188,075; expenses, taxes, etc., $90,270, increase $5829; interest charges, etc., $1,613,238; total deductions, $1,703,508.

ILLINOIS TRACTION.

August gross, $1,257,346, increase $152,836; net after taxes, $335,042, increase $12,389.

AMERICAN WATER WORKS & ELECTRIC.

For the year ended June 30—Total income, $1,480,379, decrease $57,637; net after taxes, $1,396,258, decrease $66,324; interest charges, $811,073, decrease $3274; net income, $585,185, decrease $63,050.

WESTERN STATES GAS & ELECTRIC COMPANY.

Gross and net earnings of the Western States Gas & Electric Company (California) for the years ended August 31, 1918, and 1917, are reported as follows:

	1918.	1917.
Gross earnings	$1,561,616	$1,340,331
Net earnings	640,253	630,712

QUEBEC RAILWAY, LIGHT & HEAT.

The Quebec Railway, Light & Heat Power Company reports for the year ended June 30, 1918: Gross earnings from operations of $1,797,852, a decrease of $34,179. After adding miscellaneous income of $230,088, the total revenue from all sources amounted to $2,027,941, a decrease of $34,951. Operating and maintenance expenses were $1,235,724, an increase of $79,955. The surplus after fixed charges amounted to $95,306.

LAKE SHORE ELECTRIC.

For July—	
Gross earnings	$ 220,269
Operating and taxes	140,152
Net	80,116
Jan. 1 to July 31—	
Gross earnings	1,179,111
Operating and taxes	851,717
Net	327,393
Surplus	74,282

Dividends.

Milwaukee Electric Railway & Light Co. has declared a quarterly dividend on preferred stock of 1½ per cent, payable October 31 to stock of record October 14.

Central Illinois Public Service Co. has declared a quarterly dividend of $1.50 on preferred stock, payable October 15 to stock of record September 30.

West Pennsylvania Power Co. has declared a quarterly dividend of 1¾ per cent on preferred stock, payable November 1 to stock of record October 21.

The board of directors of the Western States Gas & Electric Co. of Delaware has declared the regular quarterly dividend of 1¾ per cent on the preferred stock of the company, payable October 15, 1918, to stockholders of record September 30, 1918.

The board of directors of the Ottumwa Railway & Light Co. has declared the regular quarterly dividend of 1¾ per cent on the preferred stock of the company, payable October 15, 1918, to stockholders of record September 30, 1918.

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Oct. 1.	Bid Oct. 8
Adirondack Electric Power of Glens Falls, common	6	13	13
Adirondack Electric Power of Glens Falls, preferred	6	..	..
American Gas & Electric of New York, common	10+extra	79	79
American Gas & Electric of New York, preferred	6	39	39
American Light & Traction of New York, common	..	177	192
American Light & Traction of New York, preferred	6	91	91
American Power & Light of New York, common	4	40	40
American Power & Light of New York, preferred	6	68	68
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	6	34	35
American Telephone & Telegraph of New York	..	98	105½
American Water Works & Elec. of New York, common	..	4½	4½
American Water Works & Elec. of New York, particip	7	11	11
American Water Works & Elec. of New York, first preferred	..	56	57
Appalachian Power, common	..	3	3
Appalachian Power, preferred	7	20	20
Cities Service of New York, common	+extra	217	230
Cities Service of New York, preferred	6	71½	73½
Commonwealth Edison of Chicago	8	101½	108
Comm. Power, Railway & Light of Jackson, common	..	19	21
Comm. Power, Railway & Light of Jackson, preferred	6	36	49½
Federal Light & Traction of New York, common	..	7¼	7¼
Federal Light & Traction of New York, preferred	..	35	35
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	16	25
Middle West Utilities of Chicago, preferred	6	38	43
Northern States Power of Chicago, common	..	43	44
Northern States Power of Chicago, preferred	ex.div.7	81	80
Pacific Gas & Electric of San Francisco, common	..	36	35
Pacific Gas & Electric of San Francisco, preferred	6	78	78¼
Public Service of Northern Illinois, Chicago, common	7	77	76
Public Service of Northern Illinois, Chicago, preferred	6	78	78
Republic Railway & Light of Youngstown, common	4	15	17
Republic Railway & Light of Youngstown, preferred	6	55	55
Standard Gas & Electric of Chicago, common	..	4½	4½
Standard Gas & Electric of Chicago, preferred	/ 6	..	20
Tennessee Railway, Light & Power of Chattanooga, common	..	2	2
Tennessee Railway, Light & Power of Chattanooga, preferred	6	12	10
United Light & Railways of Grand Rapids, common	4	27	28
United Light & Railways of Grand Rapids, preferred	6	58	61
Western Power of San Francisco, common	..	11	11
Western Power of San Francisco, preferred	6	48	48
Western Union Telegraph of New York	extra	82	90
Industrials—			
Electric Storage of Philadelphia, common	4	49½	49½
General Electric of Schenectady	8	149	150
Westinghouse Electric & Mfg. of Pittsburgh, common	7	43½	42½
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	58	59